MODERN Machine Shop

HOWARD CAMPBELL, Editor

Volume 8 FEBRUARY, 1936 Number 9

A Magazine for Mechanical Executives: Construction Production Maintenance

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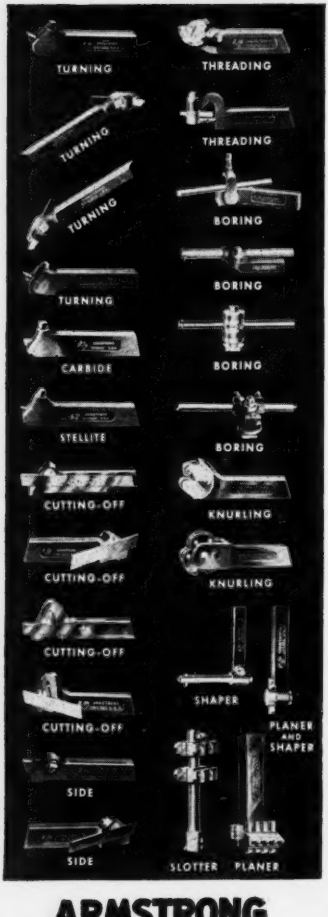

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So satisfactory, so much a part of everyday work, ARMSTRONG TOOL HOLDERS usually go from one machine tool to its successor without thought of change or improvement. A check up in most plants shows 1910, 1915, 1920 Tool Holders on 1935 lathes, planers, slotters, and shapers. Still, the years haven't passed without improvements being made in the Armstrong System of Tool Holders. New tool holders and new sizes to meet new cutting requirements are continuously added. Among the recent additions to the Armstrong System are Spring Cutting-Off and Spring Threading Tools for the new and tougher alloy steels, super HIGH SPEED STEEL cutters and bits that permit greatly increased speeds and feeds, Armide (Carbide-Tipped) Cutters and special Carbide Tool Holders, new boring bars and a line of Turret Lathe and Screw Machine Tools that take standard shape high speed steel cutters and extend the economies of the Armstrong System in the production department.

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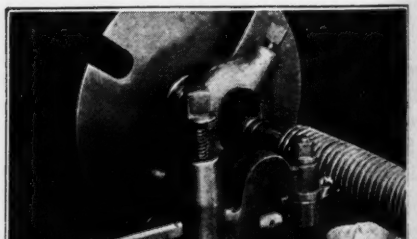

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Armstrong Tool Holders Are Used in Over 98% of the Machine Shops and Tool Rooms

MODERN Machine Shop

CINCINNATI, OHIO VOL. 8, NO. 9

FEBRUARY, 1936

Training Apprentices at the Newport News Shipbuilding and Dry Dock Company

An Outline of Apprentice Training Methods In Use in a Large Modern Shipbuilding Plant

BY HOWARD CAMPBELL

THE shipbuilding plant is a curious combination of production plant and jobbing shop. A mechanic in the machine shop may work for weeks on end on one piece after another, no two of which are alike, yet all of which are parts of a ship. Such work usually calls for a high degree of skill, therefore such an artisan can only be developed through systematic training.

It is possible to obtain a certain number of good mechanics in the open market, but the supply is far short of the demand in ordinary times, consequently it devolves upon the employer to assure himself of an adequate supply of good mechanics, trained to his needs and his methods, by selecting young men who have the necessary qualifications and then training them in his own plant. The manner in which this training is handled at the works of the Newport News Shipbuilding & Dry Dock Company, Newport News, Virginia, is outlined in this article.

The plant organization of the Newport News Shipbuilding & Dry Dock Company is classified by 19 separate crafts, involving 119 different occupations. The magnitude of the apprentice training program is obvious. The entire task of selecting and training these apprentices is under the direction of Mr. G. Guy Via, Supervisor of Training for this company, and the apprentice supervisors and teachers who assist Mr. Via.

The training course comprises not only training and practice in the operation of the different kinds of machines and tools used in the trade selected, but also includes a thorough grounding in science, mathematics, mechanical drawing, English, and

economics, particularly in the connection in which these subjects can be applied to shipbuilding. Special applications of science to the various shipbuilding crafts are taught to the boys by the apprentice instructors in the different shops. The boy who finishes such a course of instruction has laid a foundation upon which he can, if he chooses, continue his education to the point of obtaining a degree.

In view of the high type of instruction and the thoroughness of the training, every effort is made to develop in the mind of each apprentice an appreciation of the fact that he is receiving more than the rudiments of a trade; he is being trained to the art of shipbuilding, and to take his place in society on a par with the products of other schools of perhaps wider reputation but less practical application.

In every phase of his education the boy and his future are considered first, and the training course is laid out along lines that will afford the most complete education in the time allotted. These are the boy's "formative" years; in the process of teaching him skill with his hands and in training his mind his teachers never lose sight of the fact that they are guiding and fostering the growth and development of the character which is to carry a boy through his whole life.

The only requirements for consideration are that the applicant must be over 16 years old and under 21, and must be a high school graduate who has completed at least two years of algebra and one year of plane geometry. The boy who has completed such a high school course has at least learned to study—which is an important accomplishment.

Upon application for acceptance as an apprentice, the boy is given (or mailed) a "Personal Questionnaire" to fill out as indicated. The information required includes (1) Applicant's full name, (2) Address, (3) Age, height, weight, and whether right or left handed, (4) Name of father or guardian, (5) His occupation and where employed, (6) Mother living, (7) Number of brothers and sisters, (8) Trade desired, (9) Experience, if any, (10) High school attended, and where, (11) Name of principal or headmaster, (12) Rank or standing at graduation and number of members in class.

In addition to the above, the applicant is asked to indicate which of the following courses were completed with number of years and number of units: Arithmetic, Algebra, Plane Geometry, Solid Geometry, Trigonometry, General Science, Physics, Chemistry, Mechanical Drawing, Civics, Economics, and Vocational. The last he is asked to specify, and finally is asked to list the subjects in which he failed.

Extra-curricular activities are considered important as indicating whether or not certain desirable traits of character are possessed by the applicant, consequently he is asked to give particulars as to his participation in the activities listed. These include football, baseball, basketball, track, wrestling, swimming, tennis, golf, band, orchestra, glee club, dramatics, journalism, and literary, with a space for others not listed. In addition he is asked to state the church or Sunday school attended, where and whether regularly or occasionally, whether he was a Boy Scout, where and rank, what hobbies he is interested in, business ventures engaged in, and references.

The information returned to the Supervisor of Training on this sheet is considered by him to be a very fa

index to the character and capabilities of the applicant. If it is decided that he gives evidence of being good material, he is asked to present himself in person at a given time for an interview.

The boy's physical appearance and ability as indicated by his photograph, his height, weight, and other characteristics are all taken into consideration as regards his fitness for the work. His interest in athletics or other activities indicate his interest in life and whether or not he possesses the energy and enthusiasm which are so often important to success. Boys who have had some religious training are usually steadier than those who have not, and the sort of references given by the boy indicate to a certain extent his standing among the older people of his acquaintance.

It might be well to explain here that Mr. Via and his assistants have gone thoroughly into the matter of aptitude tests. Nearly all of the so-called "mechanical aptitude" tests have been given extensive trials, and the results checked and rechecked. Inasmuch as they failed to show any results over the results that can be obtained by the use of intelligence and care in the selection of the apprentices, the tests have been discarded.

After the personal interview, if the applicant is acceptable, the formal application is made out and signed by all parties concerned. The boy is then asked to appear on a Monday for his final instructions before being turned over to the instructors. In this interview Mr. Via gives the young man his first lesson in economics as it applies to manufacturing.

View of Apprentice Gallery in Machine Shop. Here the Apprentices Receive Their Preliminary Instruction in Machine Operation.

A Mechanical Drawing Class at Work

When he leaves this interview he carries with him a clear idea of just how the company operates, what enables it to survive and carry on year after year, the importance of each individual operation in the whole fabrication plan and the future that lies ahead of him, with its opportunities, if his task and all the other tasks are completed in such manner that the company can compete in the market for work and can make enough more than the bare costs of operation so that it can maintain the buildings and equipment and continue to progress in the future as it has in the past. He is also impressed with the fact that the company must be able to make enough so that it can lay aside a retirement allowance for each workman against the day when he will be forced to quit work.

From this interview the boy goes to the employment department to be entered upon the rolls and to the clinic for his physical examination. He is now a part of the organization. Upon starting work he is supplied with a toolbox containing a complete set of tools. If he fails to finish, the tools are returned to the company, but upon graduation the tools become his property, along with a chest for $100.

The first six months is generally considered as a probation period during which the new apprentice is carefully watched for indications as to what may be expected from him in the future. This six months is a part of his four-year training course, however, and the six months period is not considered as necessarily the limit for probation. If there seems to be any possibility that a boy may find his vocation in some line of work among the many that are necessary to shipbuilding, he is continued on the rolls until it has been discovered. On the other hand, there have been many cases where a boy discovered in less than six months that he was not suited to the work and accordingly was released.

The first-year apprentice is paid an hourly rate of 38 cents, which is increased to 44 cents the second year, 52 cents the third year, and 64 cents the fourth year. The starting rate is not an arbitrary figure; at this rate the boy can earn enough money to pay for board and room in a good home, his laundry, clothes (based on $100 per year), $2 per week savings, and $1 for recreation. Actually this amounts to $13.68 per week.

In the first interview the point is stressed that the boy is now about to start upon his "own", to make his

own way in the world by the use of his head and hands. Ships are built with hands, and the four-year course of instruction is for the purpose of teaching him skill with his hands. The control of his fingers, however, comes from the brain, consequently the brain must be allowed to function in the best manner possible. In the next four years he will undoubtedly develop a fine dexterity with his arms and hands as a result of practice, therefore the point is emphasized that all the experience he can get in four years is not too much and he should make the best of all opportunities to obtain this experience. Also, he should avoid any forms of dissipation which have an effect upon his nervous system.

The teaching force consists of a number of apprentice instructors who are allotted to the various departments and shops of the works, and several class room teachers who are specialists in their subjects. The work-week consists of 36 hours, of which 30 hours are spent in the shops and 6 hours in class. The class room work is divided so that the boy spends three hours in class on Monday or Tuesday and three hours again on Wednesday or Thursday. During the first period he may have one hour each of English, mathematics, and science, and during the second period, two hours of engineering drawing and one hour of practical shipbuilding.

There are no classes in the shop, but in order that each section of the training course may be identified and to make sure that the apprentice completes his term of service at each type and kind of work included in his trade, the shop training is broken down into "blocks." Thus the machinist apprentice training course includes a lathe block, milling machine block, drill press block, boring mill block, erecting floor block, layout block, and so on.

Each block has been analyzed for skill content and for technical content, and then has been divided into lessons that are numbered in progressive order according to the amount of skill required. Thus the first lesson in the lathe block may consist of centering shafts, the following lessons taking up, in consecutive order, boring, reaming, turning, taper turning, thread cutting, and so on until the student can perform any lathe operation that may be required of him. As fast as he completes all the lessons in a block in a manner that is satisfactory to his apprentice in-

One of the Apprentice Classes in Session

Block No. **SKELETON LESSON PLAN** Lesson No. 18

TEACHING UNIT: ROUGH DRILLING TO PUNCH MARK WITHIN 1/32 INCH. SIMPLEST WAY OF CLAMPING. (DRILL PRESS)

Primary or Secondary:

STEP 1—PREPARATION:

Idea 1	A drill.
2	A brace and bit for boring holes in wood.
3	Metal to have holes bored in it.
4	
5	

J. O. P.: Holes are bored in metal by means of a rotating drill under pressure.

STEP 2—PRESENTATION:

Point 1	Secure work properly on table.
2	Select proper drill for size of hole to be bored.
3	Place drill into spindle securely.
4	Bring point of drill to the center of punched mark and secure drill press in this position.
5	Set machine for proper feed and speed.
6	Start machine; apply feed.
7	Continue operation of machine until hole is drilled.
8	

Block No. **AUXILIARY INFORMATION** Lesson No. 18

(STEP 2—PRESENTATION)

Teaching Point	TRADE TERMS	SAFETY	CARE OF TOOLS, ETC.	SCIENCE	STOCK
1	Wrench; table; clamps; parallel; packing; "T" slots; bolts and nuts.	Be sure job is secure; Proper size wrench for nuts.	Have full hold on nut with wrench when clamping.	Location of work on table Clamping to prevent spring in work.	
2	Drill		Care in handling drill.	Size and kind of drill to be used.	
3	Drill sockets; Spindle; Drill Shank; Tang; Burrs.	Drill and socket to be tight in spindle.	Never use hammer on socket or drill.		
4	Punch marks; Center punch: Locking device: Rail.			Taking lost motion out of rail. Height of rail from table.	
5	Feeds; Speeds; Belt; Pulley; Gears.	Never change speeds or feed when machine is in motion.	Lubricate machine.		Knowledge of working properties of stock.
6	Belt shifter; Starter button feed lever; Cutting compound; Drift key.	Keep clear of drill while in motion.	Care not to drill through metal into machine table.	Speeds and feeds to use. Kinds of lubricants to be used.	
7					
8					

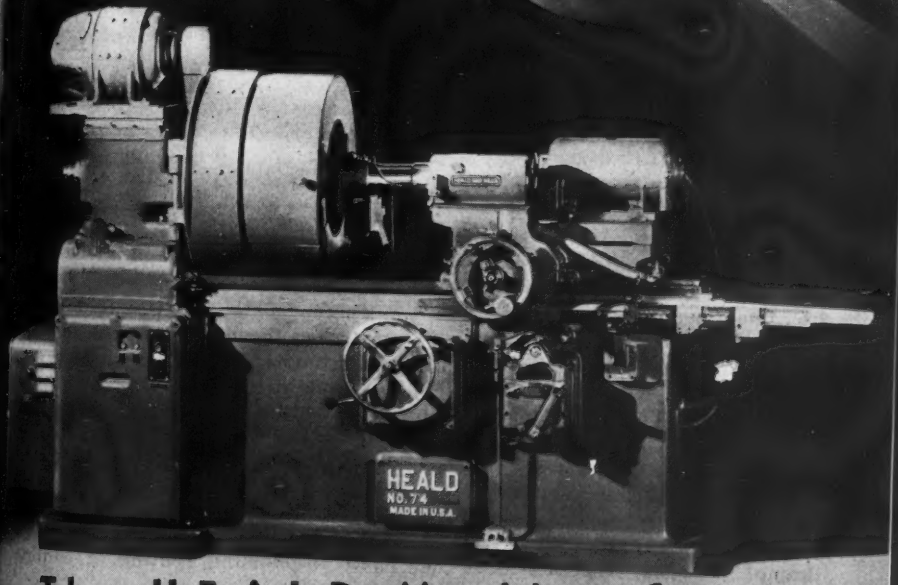
Sample of a Skeleton Lesson Plan Used in Teaching Machinist Apprentices

Large Horizontal Internal

Finishes Holes 20" dia. x 15" Long

THE new Style No. 74 large, heavy duty, horizontal internal grinding machine has all the convenience and flexibility of operation, yet fills the demands for a tool to take care of larger work than it has been possible to handle on the No. 72 line.

Largest bore normally ground, 20" dia. x 15" long; table stroke, 38"; swing inside water guard, 27" dia.; swivel of workhead forward 30°; net weight 13,000 lbs.



The HEALD Machine Company

WORCESTER, MASSACHUSETTS, U. S. A.

Name 10047 Britt, E L 1934-1935

	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	TOTAL	TOTAL
Rank	13	5	17	12	12	23	10	13	9	NO. OF	NO.
D. Present	6	10	8	8	9	8	8	8	10	POINTS	LSNS. 75
Mathematics	95.0	98.0	96.3	98.0	100.	98.8	96.2	91.3	92.0	3655	38
Science	90.0	97.0	92.0	98.0	90.0	95.0	92.5	95.0	86.3	2205	24
English	85.0	85.0	85.0	85.0	85.0	85.0	90.0	90.0	90.0	780	9
Economics	85.0	90.0	90.0	85.0	85.0	90.0	90.0	90.0	90.0	795	9
Drawing	93.3	92.5	90.0	92.5	90.0	85.0	90.0	91.7	91.7	1825	20
Shipbldg.		97.0	96.0	95.0	97.0	86.0	98.0	98.0	96.0	772	8
TOTAL	4483	5595	5493	5535	5470	5488	5567	5560	5460	10032	108
AVERAGE	89.7	93.3	91.6	92.3	91.2	90.0	92.8	92.7	91.0		91.6
Index											

Apprentice Classroom Record for a Nine-Months Period

structor, he is started on another block, in this manner eventually completing every section of the training course.

One section of the machine shop has been equipped especially for apprentice training, and is known as the "Apprentice Gallery." The gallery is equipped with engine lathes, drill presses, turret lathes, a slotter, a horizontal boring machine, two vertical boring mills, milling machines, and various other machines and equipment. During the first two years of the boy's training he is kept with other apprentices in a group apart from the other workmen, and the first seven months of this time is spent in the "Apprentice Gallery." During his stay in the gallery he is made familiar with each type of machine tool.

All jobs upon which the boys work in the Apprentice Gallery are production jobs, comprising a shop within a shop. The instructor selects the jobs from among the work passing through the shop. The success of the apprentice training program depends in a large measure upon the cooperation of the production executives, but this cooperation is 100 per cent. At the present time there are 28 boys in the Apprentice Gallery.

The equipment in the Apprentice Gallery also includes a time clock and the necessary forms for operating a time keeping system, and planning, routing, and despatching methods. Each boy in turn is given the job of planning and allotting the work for the other boys in the department, so that he will become familiar with the methods used.

The boys who show the best grades are given the best opportunities, and upon completion of their training may be made supervisors or given an opportunity in the engineering department. The text books used in class room work are the same as those used in good technical schools.

Each month one of the boys is selected for two months training in the office on planning, routing, scheduling

The growth of industry and the development of new products have brought pressing needs for tools of character. Cincinnati Shapers have played their part successfully for well-known companies all over the world. They have given to all a service beyond their hopes. They will serve you equally well. No obligation incurred in writing for catalog.

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costs, tool design, stores management, follow-up on jobs that are to be routed through several departments, and other management functions for the whole shop. The boy selected for this special training is usually one who has shown that he is unusually capable.

Upon completion of his period in the Apprentice Gallery, the apprentice is placed with a group in one of the shops where he is given regular production work to do, but does it under the direction of an apprentice instructor. This instructor selects jobs from the routine work passing through the department and each boy in turn is given a chance to learn the procedure required for the completion of all types and kinds of jobs.

As soon as he shows that he is familiar with the work in the department or on a given type of machine the apprentice is moved to another machine or department where the process is repeated. Some of the boys become familiar with the work in each department of the plant in the course of their training; but occasionally one finds the work in one department so well that he asks to be left there permanently. If there is no reason for refusing, his request is granted.

At the beginning of the month each instructor is given a report for each boy under his charge. This is a "grade" card, and at intervals of perhaps twice a week the instructor makes a mark on each card opposite the grade he thinks should be given for the quality specified. At the end of the month, the cards are sent to the Director of Training, who grades the boy accordingly. These grades are then transferred to the permanent record of the boy's progress.

From this record a curve is plotted which shows at a glance just what progress, if any, the boy is making, whether he is exceptionally intelligent, or whether he is failing to keep up with the work that has been laid out for him. Incidentally, the distribution of grades on the cards gives Mr. Via a good idea as to just how efficient his instructors are, so that if one instructor grades high and another one consistently, it is at once apparent and the boy is not discredited for what may appear to be low marks in certain subjects.

(Continued on page 64)

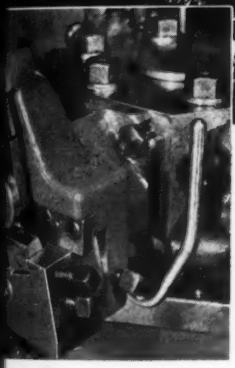
Name .....

TRADE ABILITY (Aptitude)	CRAFT MORALE (Attitude)
WORKMANSHIP (M) Expert Skilled Satisfactory Mediocre Crude	CURIOSITY (I) Eager Inquiring Average Passive Indifferent
DEXTERITY (M) Adept Clever Handy Clumsy Bungling	MEMORY (I) Exceptional Retentive Average Fair Defective
SPEED (M) Swift Fast Standard Moderate Slow	RESOURCEFULNESS (J) Ingenious Clever Reliable Ineffective Helpless
ACCURACY (M) Exact Accurate Adequate Faulty Inadequate	INTEREST (Mo) Intense High Normal Moderate Low
CONFIDENCE (T) Inspiring Positive Certain Uncertain Lacking	INITIATIVE (Mo) Diligent Industrious Willing Listless Indolent

151049-H

..... Instructor

Form Used for Reporting Shopwork Progress



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Using the new Warner & Swasey heavy duty bar turner, shown here . . . It is 30% heavier but 8 times stronger . . . *design did it!*

For outstanding performance you need the finest tools . . . and the finest turret lathes . . . otherwise work is slow and costly . . . We can help lower your costs . . . now or whenever you need it.

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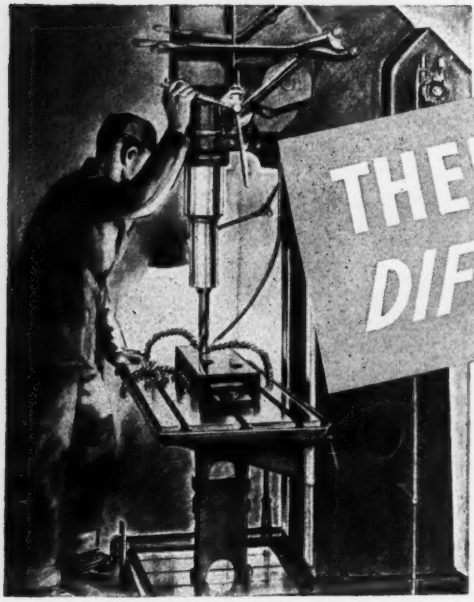
Cleveland, Ohio



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IN LONGER TIME BETWEEN RESHARPENING

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Try a Morse Tool on your next drilling, reaming, threading or milling job and you'll *know* "there is a difference". You'll give up the idea that all leading brands are alike when you see it cut—see the clean work it does—and count the extra time it works faithfully before resharpening.

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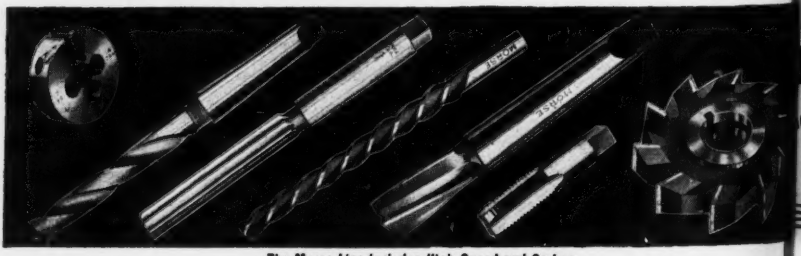

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TRADE ABRASIVE MARK REGISTERED

R

Tool Maintenance at the Foote-Burt Plant

By R. C. Heinmiller,
Plant Engineer, The Foote-Burt Company, Cleveland, Ohio

As every manufacturing executive knows, in these days of high speeds and heavy feeds the bill for perishable tools and cutters comprises a very important part of the operating expense. Ways and means are constantly being devised to provide better control of the tool stocks and to reduce the losses resulting from carelessness in keeping track of the tools on the job and in the toolrooms, hoarding of the tools by the operators, inefficient sharpening, and so on.

Hoarding of tools by the machine operators may seem negligible, yet it is well known that operators are prone to provide insurance against the possibility of a shortage of the particular kinds and sizes of to used on their operations—especia if they are working under an inc tive system—by storing extra tools their lockers or tool kits. The wri has known of cases where a thoro search of the shop furniture brou to light hundreds of dollars worth good tools that had been hidden the operators as provision against possible temporary shortage.

Not the least important of drains on the tool budget is t which is fostered through allow the machine operators to shar their own tools. Cutters, of cou must of necessity be ground on a chine, but the user of the tools infrequently takes the stand that better than a one else, kn just how his t should be grou This idea is f lacious. All ting tools ca and should b standardized, standardized t can better ground by

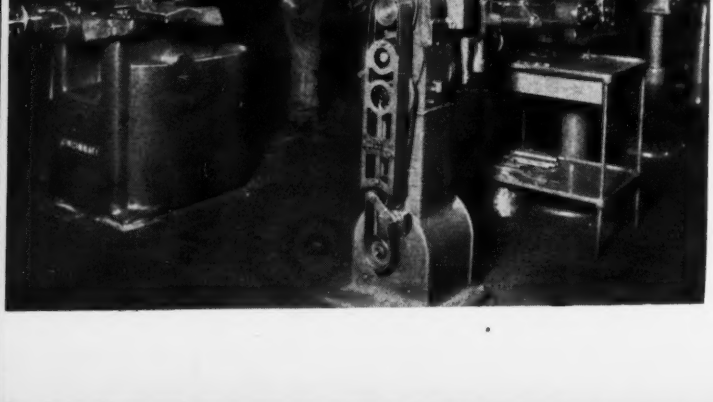

Fig. 1—View o Part of the Ce Tool Grinding De ment at the Fo Burt Plant, C land, Ohio.

NEW ACE 60 SPOT WELDER

FOR CONTINUOUS PRODUCTION FOR WELDING UP TO 2 PIECES 16 GA. STEEL 12" THROAT

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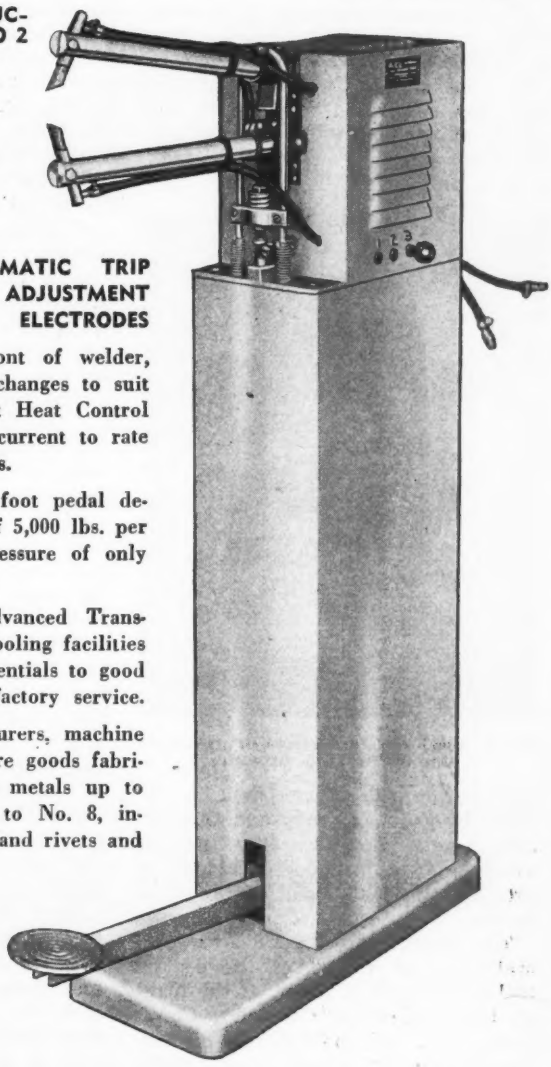
Complete.



EQUIPPED WITH AUTOMATIC TRIP SWITCH AND TIMING ADJUSTMENT AND WATER COOLED ELECTRODES

All adjustments are in front of welder, easily accessible for quick changes to suit work at hand. Has 3-point Heat Control Switch for setting welding current to rate suitable for various materials.

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perts, using special equipment, than by the machine operators.

Granting the ability of a trained and experienced machinist to grind a lathe tool efficiently, no matter how experienced he may be, he cannot possibly grind a drill point as accurately as it can be ground by machine, nor can he grind it passably well without spending much more time at the task than is warranted. The modern drill

Fig. 2—Small drills are accurately ground on this Sellers Drill Grinder.

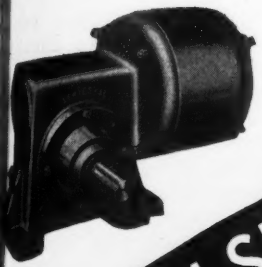
grinder, on the other hand, is the result of years of study and development, and comprises the perfect example of a machine developed to produce an ideal result in an ideal manner.

The illustration Fig. 1 is a general view of a part of the central tool grinding department at the plant of the Foote-Burt Company, Cleveland, Ohio. At the left can be seen the Cincinnati tool and cutter grinder upon which the majority of the milling cutters and similar tools are ground. At the rear of the Cincinnati machine is a LeBlond cutt grinder, and farther along is an I gersoll tool grinder, not visible the illustration.

In the immediate foreground is Oliver drill grinder, and just back this machine is a mechanic picture in the act of putting the finishi touches to a drill point in an Oliv drill-point-thinning machine. The drill sharpening machines are agai illustrated in Figs. 2, 3, and 4.

Although the central grinding de partment is not at the present tim located in the enclosed area devote to tool handling and storage, it i actually a part of that departmen All tools are drawn from the to storage, and all tools are returne to the tool storage for credit whe the job for which they were draw is completed, when repairs are nece sary, or when sharpening is require Tools that are turned in after havin been in use are not returned to the bins immediately; they are laid asid and turned over to the central grin ing department for resharpening that, no matter when they are calle for, they will be ready for use. On the very large cutters, such as larg face mills, are delivered directly t the grinding department. Such too are not easily misplaced, and hand ling is an important item in the ca of such large cutters. After grind ing, all tools excepting the very larg cutters referred to are returned t the tool storage, from which they a again issued to the users.

Each machine operator is allowe to draw one complete set of tools fo the job upon which he is working and these can be exchanged at th tool storage for sharp tools whe they become dull or worn. Duplicat sets of all special tools are made u and kept on hand so that tools a always available for any operatio In cases where the tools are small



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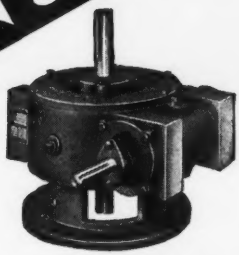

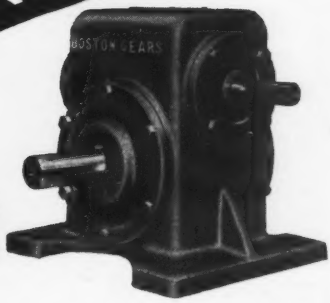

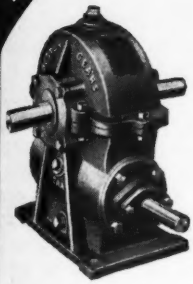

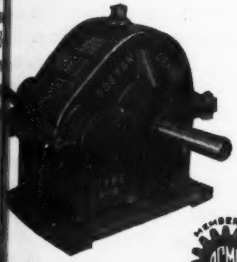

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of a type that is easily damaged or broken, several sets are maintained. Thus it is unnecessary for any mechanic or machine operator to suspend production on his job while he spends time sharpening tools; the only time lost on production jobs is that necessary to exchange the dull tools or cutters for sharp ones.

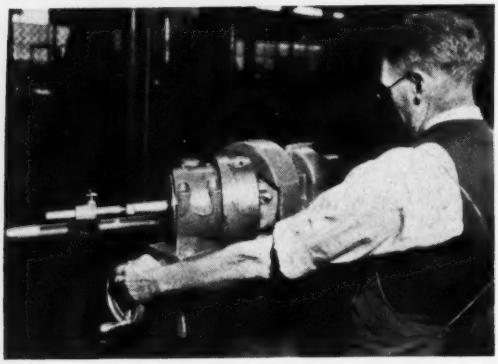

Fig. 3—Large drills are ground in this Oliver "Drillpointer."

In this plant, as in most other metal manufacturing plants, drill sharpening forms an important part of tool maintenance. And in this plant, particularly, the value of properly-ground drills is appreciated. In Fig. 2 a mechanic is shown in process of grinding a small twist drill in a Sellers drill grinder. In view of the fact that small drills are the hardest to grind with any degree of accuracy, the Sellers Company designed this machine—the Sellers No. 05D—especially for the sharpening of drills smaller than ½ in. diameter.

The task of designing this machine entailed a great deal of research in order to discover the best possible method of grinding a drill so that it would cut not only accurately, but also with the least consumption of power. When the point of a drill is in such condition — whether new ground or not — that an abnor amount of power is required to f it into and through the work, not o is the drill itself strained unduly, the machine is also subjected strains which rack and wear it so t either the maintenance expense the machine is high and life is materially reduced sooner or later it fails al gether. Thus power-consum tion becomes an import factor.

Having developed a p fect drill point, the task th became one of developing machine which would p duce this point. The m chine illustrated in Fig. 2 the result. In this machi the drill is held at th points, between two harde steel jaws that grip the edg of the flutes as closely as p sible to the cutting edges the lips and an adjustable back cen that supports the shank of the dr leaving the body of the drill free. T chuck is opened or closed by mea turning the hand wheel, by this mea clamping the drill so that no ha pressure is required to hold the dr while in process of grinding. T drill is held so that its axis is in c rect relation to the axis of the grin ing wheel to automatically provi clearance which increases in the c rect proportion from the periphe to the point of the drill. Thus t drill is ground with lips of equ angle, length, and clearance.

Large drills are ground in t Oliver No. 51 "Drillpointer" shown operation in Fig. 3. This machine made expressly for grinding dri from ½ in. to 3 in. diameter, althou smaller sizes of this same machi are made for grinding the small

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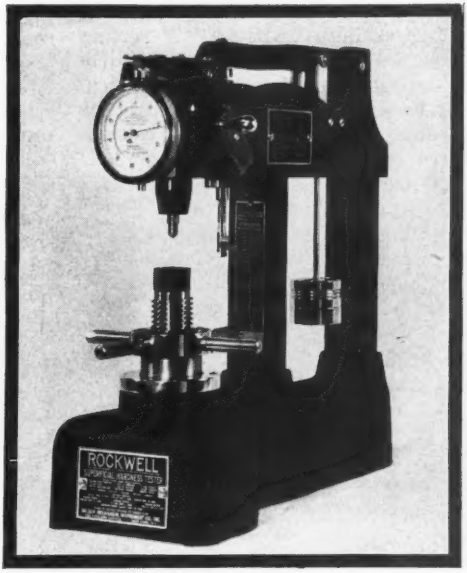

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drills. In this machine, also, the drill is held in a chuck that grips it close to the cutting end and holds it in a perfectly central position while the lips are being sharpened. A setting gage insures the setting of the drill at the right angle so that the drill will be ground properly. With this machine the grinding is not concentrated on one lip at a time; light cuts are taken from each lip alternately and thus each cutting edge, in turn, is given a chance to cool. The grinding action is also at right angles to the cutting edge, which aids in carrying the heat away from the cutting edges. Heat becomes an important factor in the grinding of the larger drills, due to the bulk of the metal and the amount of grinding involved on the average large drill in order to properly condition it.

Accuracy in the grinding of the small drills is important because of the exceedingly small amount of allowable variation. In the case of the large drill, however, to this factor must be added the factor of machine maintenance. As the size of the drill increases, the importance of the power factor also increases, making it doubly necessary that the drill be ground so as to present the least possible resistance to entering the work and thus keeping the strain and wear on both the drill and the machine at the minimum.

To aid in providing the drill with a point that will be accurately centered, ground at exactly the right angle, and which will be thin enough to enter the work with the minimum of resistance, the Oliver "Point-Thinner" shown in Fig. 4 is used. It is easy to understand that the web i twist drill must be increased as size of the drill is increased, in or to withstand the high speeds heavy feeds of modern manufact ing. At the same time, this th web places an added burden on machine, due to the extra power quired to force the drill into

Fig. 4—The "Point-Thinner" thins the web at the p of the large drill, centers the point of the web, pres the original top rake, and grinds the whole fac the cutting lip.

metal. Consequently the logical w to relieve the strain is to thin web at the point of the drill—whi can only be properly done by the of a properly-designed machine.

Hand thinning in most cases to a more or less degree ruin wh ever accuracy has been imparted the drill by the sharpening operati The "point-thinner", on the oth hand, holds the drill in the corr position, and not only thins the w but also grinds the whole face of t cutting lip, preserves the original rake, corrects any out-of-center c dition of the web, and corrects out-of-index condition of the lip.

(Continued on page 64)

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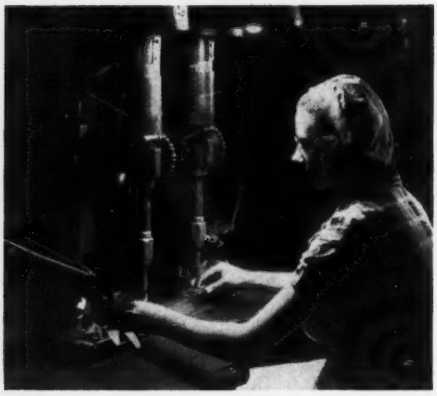

Methods Engineerin Procedure Time Formulas fo Rate Setting

By H. B. Maynard,
President, Methods Engineering Council, I
Pittsburgh, Pa.

The fifth article, in which the author explains the setting of rates by the use of constants.

ONE of the most useful devices of the methods engineer for rate setting purposes, particularly where lot sizes are small and the work varied, is the time formula. The making of a time study is a rather lengthy procedure, and when job shop conditions are approached, it becomes impractical to study in detail every operation performed. In many cases, the establishing of time allowances by detailed time study would necessitate assigning one methods engineer to every productive worker. Instead of establishing values by time study, therefore, the methods engineer collects data and derives time formulas. He studies the work as a class performing all analysis and motion study work at one time, and then compiles a formula which enables him to establish time values quickly and accurately.

A time formula is neither mysterious nor academic; it is merely a convenient way of expressing the manner of variation between two or more interdependent variables. When all but one of the variable quantities a known for a given set of conditio it is quite easy to find the unkno quantity by substituting in and so tion of an algebraic formula. Mo specifically, t unknown is t time for doing particular ope tion, and the v riable factors a size, shap weight, comple ity, and so on.

Time values or piece rates whi are established by formulas are n estimates, but are accurate scienti ically determined time standards. T illustrate; if a part having a volu of four cubic inches is weighed a is found to have a weight of o pound, then it is apparent that a other part made of the same materi which has a volume of eight cub inches will weigh two pounds. T weight of two pounds is not obtain

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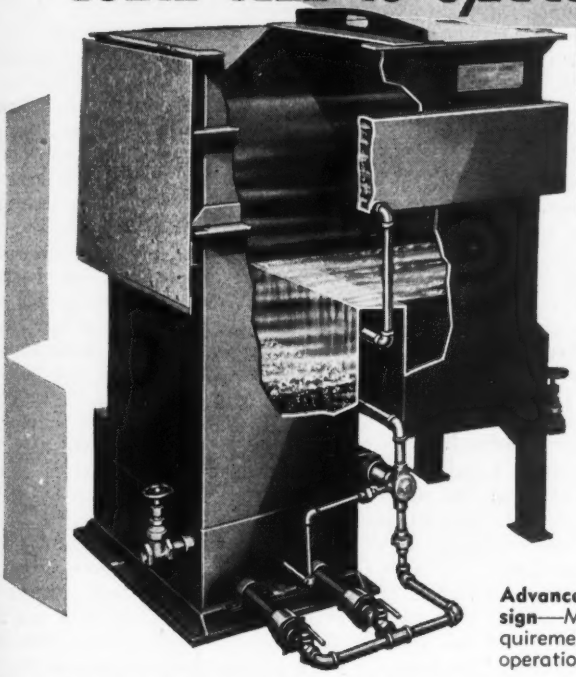

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by estimating but rather is the result of applying known facts.

Consciously, or unconsciously, the formula $x = \frac{y}{4}$ is set up where $x =$ weight in pounds and $y =$ volume in cubic inches. As long as the material remains the same, this formula can be used to compute weights when the volume is known or vice versa. The same principles can be applied to time study work. The formula expressions will be somewhat more complicated than that given above, and considerable detailed work will be required to derive them, but once they are available, they can be used to establish time values which are accurate beyond doubt or question. They simplify the work of the methods engineer, and make incentive installations possible in shops where otherwise they would be out of the question.

Deriving a Time Formula

A special technique is required to derive a time formula, but the principles used are simple and based upon common sense and can readily be understood by any shop man.

The first step in the derivation of any formula is the making of a general analysis and survey of the work the formula is to cover. The limits of the formula should be defined, and methods, conditions, and so on should be carefully scrutinized with the idea of making improvements. Often this general analysis will uncover opportunities for improvement which have previously been overlooked even when detailed studies have been made of individual jobs. The viewpoint is broader, and such items as improved handling methods, better layouts, and so on will suggest themselves.

When the preliminary work has been completed, the methods engineer begins to collect time data. This h does by making detailed time studie on representative jobs within the fiel which the formula is to cover. H studies the largest jobs and the small est, the most complicated, the sim plest, and a number of other job which lie within extremes.

Assume, for example, that th methods engineer has decided to de rive a formula for horizontal milling machine work. In order to keep the formula expression from becoming too unwieldly, he decides that the formula shall cover only work which may be held in a vise and milled on small horizontal milling machines. This limits the size of the parts milled to what may be classed as small and medium. The machines which are used for doing this work all have the same operating characteristics, and standard vises bolted to the machine table with two bolts are used to hold the work.

The methods engineer, having de cided upon the data he will need, pro ceeds to get it either from existing accurate time studies or by making entirely new studies. The latter pro cedure is usually preferable unless the existing studies have been care fully made upon parts which are fully identified. There are two types of elemental operations which must be kept carefully separated for for mula work, and unless this was done when the existing studies were made it is preferable to take new studies.

The two types of elements are known as constants and variables. A constant elemental operation is one the time for performing which is not affected by the characteristics of the part being worked upon. "Start Ma chine" is an element of this sort. The size, shape, material, and so on of the part do not have anything to do with the motions used to start the machine. The time for variable el

GROUND from the SOLID *after* HARDENING means

The photograph at right shows the four major steps in the BATH process . . .

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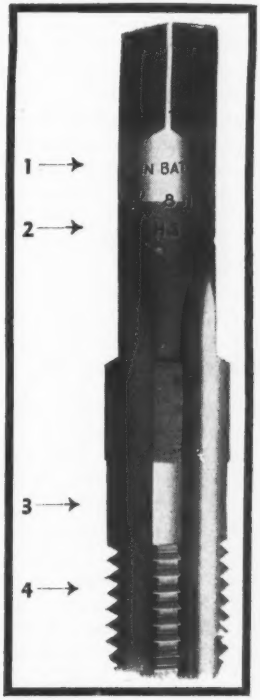

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ments is affected by the characteristics of the part being machined. Cuttig time is a variable, being determined by the length of cut and feed and speed which in turn are determined by the material, amount of material removed, characteristics of the cutter, and like factors.

When a sufficient number of studies have been made, the resulting data are posted on a form known as the Master Table of Detail Time Studies. The purpose of this posting is to aid in the systematic analysis of data. The description of each element is listed and the time required to perform that element on every study made is posted. The resulting arrangement makes it easy to classify operations as constants and variables and shows at a glance which operations are performed on every job and which only in special cases. Time values are selected for the constant elements, and curves, tables, or charts are used to express the variables.

The data which results from a study of the milling machine work defined above will take the following form:

A	Pick up small part from table	.0006
B	Put small part in vise	.0009
C	Pick up medium part from table	.0007
D	Put medium part in vise	.0010
E	Tighten vise and hammer down part	.0024
F	Start machine	.0003
G	Move table forward per inch or fraction thereof	.0007
H	Engage Feed	.0003
I	Mill	See Cutting Table
J	Release Feed	.0003
K	Stop machine	.0014
L	Return table per inch or fraction thereof	.0005
M	Release Vise	.0009
N	Remove and lay aside small part	.0017
O	Remove and lay aside medium part	.002
P	Remove cuttings from vise	.002

The data may be applied in th form given above and often is. Whe the methods engineer receives drawing or a sample of a part whic is to be milled, he visualizes and list the elemental operations which mus be performed. For example, the ele ments performed on a medium size part would be listed and the element times filled in as follows:

Pick up medium part from table	.0007
Put medium part in vise	.0010
Tighten vise and hammer down part	.0024
Start machine	.0003
Move table forward 4 in.	.0028
Engage feed	.0003
Release feed	.0003
Stop machine	.0014
Return table 6 in.	.0030
Release vise	.0009
Remove and lay aside medium part	.0028
Remove cuttings from vise	.0028

The sum of these elemental time or .0171 hour is the correct handling time for this job. The cutting time is either obtained from a specially prepared table or is computed from the feed and speed which are found to be proper for the job.

This method, however, is cumbersome and much work is needlessly repeated. For example, it is evident that every time the machine is started it must also be stopped. Hence the times for "Start machine" and "stop machine" can be added together and one value can be used instead of two. Other combinations can similarly be made until only a few major groups need be considered.

On every job, small or medium operations E, F, H, J, K, M, and P

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Joe Lane *"Greenfield"* salesman in Philadelphia, reports: A storage battery manufacturer has gone 100% "Maxi" after finding that 12-24 "Maxi" Gun taps in hard rubber jumped his production per tap by 50%.

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are performed. Thus is may be said that

$E + F + H + J + K + M + P = .0003 + .0003 + .0003 + .0014 + .0009 + .0020 = .0076 =$ constant per part milled.

Similarly

$A + B + N = .0006 + .0009 + .0017 = .0032 =$ constant per small part

$C + D + O = .0007 + .0010 + .0020 = .0037 =$ constant per medium part

All this may be combined in a single simple formula expression which will include values for advancing and returning the machine table and the cutting time as follows:

$.0108 + .0005\ S + .0007\ T + .0005\ T_1 + X =$ allowed time for vise jobs.

Where

S = Use only if part is classed as medium in size.

T = No. of inches table is moved forward.

T_1 = No. of inches table is returned.

X = Cutting time.

To use this expression to establish a value on the part mentioned above, the methods engineer classes the part as medium and determines from the drawing and his knowledge of the work that the table must be advanced 4 in. and returned 6 in. Substituting in the formula expression, we have

$.0108 + .0005 + .0028 + .0030 + X = .0171$ hour $+ X$.

The same handling time is thus obtained as above but with far less effort. Cutting time is determined as before.

(To be continued in the March issue)

Tool Maintenance at the Foote-Burt Plant

(Continued from page 54)

other words, it gives the drill a perfect cutting edge and insures accurate holes from any drill regardless of structural variations.

The whole matter of tool handling and maintenance is one which, in too many cases, is handled in a loose and slip-shod manner. Control of tool purchases should begin at the point of use; not at the buyer's desk. No plant manager ever has an idea of the amount of waste that takes place through poor handling of perishable tools until he begins to demand an accounting for each and every tool that goes into the shop. And such an accounting is possible only when the tools are allotted according to the jobs upon which they are to be used and when all tool sharpening and repairing is handled through a central tool maintenance department.

Training Apprentices at Newport News

(Continued from page 42)

However, it so happens that now and then a boy doesn't fit the work, for one reason or another, and then he is called in and told so. The boy who lacks skill with his hands may be very quick indeed at mental work, or sales work, or any one of a multitude of other tasks where skill with the fingers is not essential. Mr. Via points this out to the boy and assists, if possible, in obtaining for the boy a chance at the kind of work he seems best fitted for. As a consequence, Mr. Via has never yet discharged a boy who didn't thank him for the assistance rendered in getting him located in the right kind of work.

In addition to his tools and the $100 which are given to the finished apprentice, he has a job for as long as he wishes to stay with the company and as long as he performs his work in a satisfactory manner, if work is available.

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Socket Head Cap Screw

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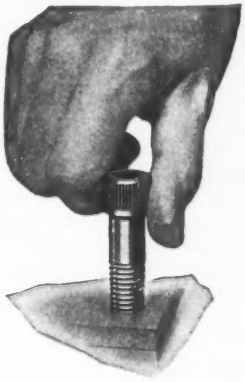

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Fingers become geared to the knurled "Unbrako" and therefore can't slip

Lock Nut Designs

By John A. Honegger

THE accompanying drawings illustrate a number of methods that have been developed to prevent nuts from loosening as a result of vibration. Some of these methods are in common use in one industrial section and some in another, but all have been used successfully at one time or another.

Figure 1 illustrates the common double nut method, in which one nut secures the bolt and the other, known as a check nut, prevents the clamping nut from loosening. This is probably the oldest, simplest, and best-known device for locking a nut on a bolt.

Figure 2 illustrates a method that is sometimes used to prevent a single nut from loosening. Before placing the nut on the bolt or stud, the nut is sawed part way through, as shown, and the slot is partly closed by striking the nut with a hammer at a point just above the slot, or by clamping the side containing the slot in a vise. Closing the slot slightly throws the thread out of line so that when the nut is screwed down, the thread will bind and thus prevent the nut from turning.

Figure 3 shows a method commonly used to prevent a nut from working off the bolt. The end of the bolt is countersunk deep enough so that, when the nut is in position, the "rim" at the end of the bolt can be hammered down or "riveted" over. The nut can only be removed by filing or grinding off the end of the bolt that projects above the nut.

Figure 4 illustrates a method that has been used by the writer on a number of occasions with satisfactory results. A hole is drilled into the end of the bolt and reamed out with a taper pin reamer, then the end of the bolt is slotted. After the nut has been screwed down as tightly as possible, a taper pin is driven into the hole. On small bolts or screws the pin is allowed to project far enough so that it can be pulled out. On the larger bolts the taper pin is tapped out and a screw inserted that can be gripped to remove the pin.

Figure 5 is a variation of the method illustrated in Fig. 4. In place of the taper pin, however, a screw with a head having a gradual taper is used.

Figure 6 illustrates a method that is employed by the majority of ball bearing manufacturers to lock the race nuts in place. A slot or keyway is milled in the side of the shaft and a washer with both an internal and external tongue is slipped into place with the internal tongue in the slot. After the nut has been pulled down into place the external tongue is bent up against one of the flat sides of the nut, as shown, making it impossible for the nut to revolve. Sometimes the washer is made with three prongs so that at least one of the prongs will always be in line with one of the flats on the nut when the nut is drawn tight. Usually, however, this is not necessary.

Figure 7 is the conventional castellated nut, held in position by a cotter pin which passes through a slot in the nut and at the same time through a hole in the bolt or stud.

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Figure 8 shows a method that is sometimes used on large nuts, although it is not practicable for use on the smaller ones. This method consists in drilling and tapping the nut for a setscrew, as shown. The same method can be used to lock a bolt that is to be screwed into a blind hole.

Figure 9 shows a commercial lock washer that has been placed on the market by the Positive Lock Washer Company, Newark, N. J. The washer is made with prongs which tend to dig into the bottom face of the nut and the surface of the work and thus prevent the nut from working loose.

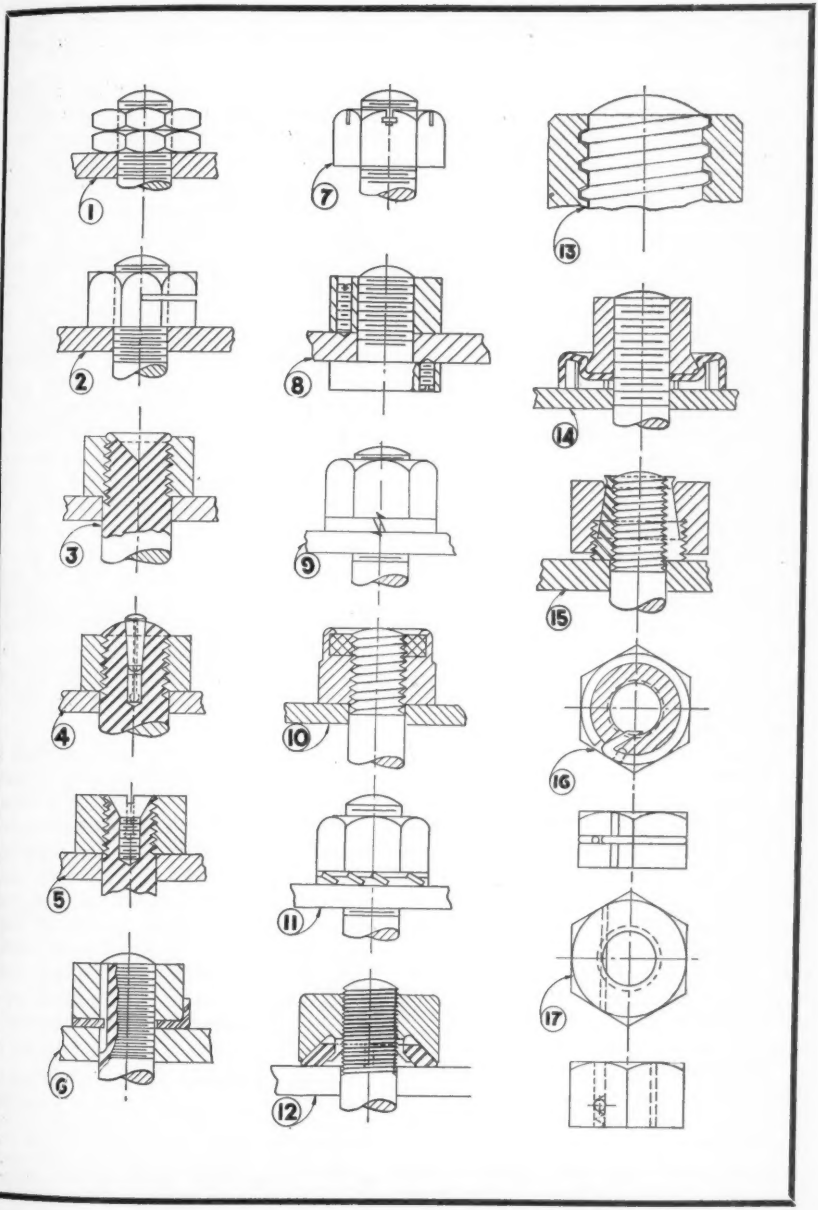
Figure 10 is known as the "Elastic Stop Nut" and is marketed by a corporation of the same name in Elizabeth, N. J. The upper part of the nut is recessed and a fiber washer is seated and locked in the recess as shown. Through the center of the washer is a hole of approximately the same diameter as the root diameter of the thread on the bolt or screw. When the nut is drawn down, the thread on the bolt forces its way through the washer but the washer hugs the bolt so tightly that the nut is prevented from working loose.

Figure 11 illustrates the design of the "Shakeproof" lockwasher, made by the Shakeproof Lock Washer Co., Chicago, Ill. In stamping out these washers, a number of radial lugs are formed and bent at an angle to the face of the washer so that the lug extends both above and below the flat surface of the washer. When the nut is tightened against the washer these lugs are flattened to some extent, but the edges of the lug tend to dig into the bottom face of the nut and the surface of the work, thus holding the nut firmly in position.

Figure 12 shows a combination lock washer and nut-locking device consisting of a split washer which is assembled into a conical recess in the bottom of the nut. When the recess is cut, however, care is taken to leave the thread. When the washer is placed in the recess, it projects past the bottom surface of the nut as shown. As the nut is pulled down into place, the washer is forced into the recess, gripping the thin barrel containing the thread and causing it to bind on the stud tightly enough to prevent the nut from working loose. To facilitate the gripping action, the barrel section is split in several places to provide clearance so that it can be forced tightly against the thread of the stud. This nut is a product of the International Safety Lock Company, 67 Broad St., New York, N. Y.

Figure 13 is a patented type of lock-nut construction that is being marketed by the Dardelet Threadlock Corporation, Harrison, N. J. The root of the thread in the nut is made with a slight taper while the balance of the thread is made so that clearance is provided around the thread of the screw. The nut threads loosely onto the bolt until it comes into contact with the surface of the work, at which point tension is produced. As the nut is further tightened, the tapered core diameter of the nut rides up onto the tapered root diameter of the thread, developing a wedging action in which the nut is expanded a minute amount but enough to provide a self-lock which is highly effective.

Figure 14 illustrates a locking method developed by the writer and which has proved very successful. Two-thirds of the nut is hexagonal, the remaining third being cylindrical and slightly tapered. The washer used with this nut is made of spring steel, formed to a shape similar to



Drawing Illustrating Various Types of Nut-Locking Devices

that of a brake drum with a recess in the closed end. Although this end appears to be "dished" in the illustration, actually it is flat until sprung downward by the nut. The periphery of the washer is slit in several places, and the edge is serrated for gripping purposes.

In use, the washer is slipped over the end of the bolt and the nut is screwed down. In the unflexed position, the nut can enter the recessed portion of the washer, but as it is drawn down it presses on the surface of the recess, carrying it down and forcing the wall of the recess to converge upon the tapered portion of the nut, producing the necessary binding action. Usually the nut is tightened down until the under surface of the recessed portion is in contact with the surface of the work.

Figure 15 illustrates another locking arrangement designed by the writer for use where a device of the assembled lock nut type was desired. The nut is made in two parts; an inner section which is screwed down onto the bolt or stud, and an outer section which is screwed down onto the inner section. The inner section is threaded to fit the bolt, threaded for about one-third of its length on the outside, tapered the other two-thirds, and split so that it can be drawn tightly against the thread on the bolt. The outer section is recessed half-way up from the bottom surface, threaded in the recess to fit the outer thread on the inner section, and tapered in the upper half of the hole to fit the taper on the outside of the inner section.

The nut is screwed onto the bolt in the usual manner until it contacts the surface of the work. Further turning causes the outer section of the nut to revolve on the inner section and, as it is screwed down, the taper in the outer section forces the inner section to grip the bolt so that it would be impossible for it to work loose.

Figure 16 shows another method that has been used successfully on large-size nuts to prevent them from working loose. In this case an annular groove is cut into the nut to a depth that will accommodate a circular spring. The spring is made with one end bent in and barbed, and a hole is drilled through one side of the nut to take this barbed end, as shown. Upon threading the nut onto the bolt or stud, as the barbed end of the spring comes into contact with the end of the thread on the bolt it is pushed back until it drops into the V of the thread. Further tightening of the nut causes the end of the spring to drag, but any attempt to revolve the nut in the opposite direction causes the barbed point to dig into the stud. To remove the nut, the end of a nail or wire is inserted under the spring in a groove that has been milled vertically in one of the flat sides of the nut and the barbed end is withdrawn, allowing the nut to be reversed.

Figure 17 shows a method that is often employed to prevent an adjusting nut from revolving, as a result of vibration, after the adjustment has been made. This device consists simply of drilling a small hole through the nut horizontally in such a way that a short length of wire inserted into the hole acts as a friction device to prevent the nut from revolving. This device is used on a portable typewriter of popular make.

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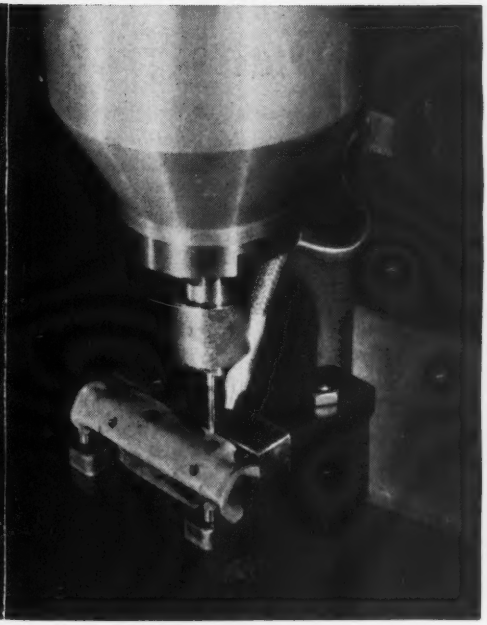

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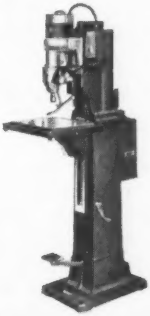

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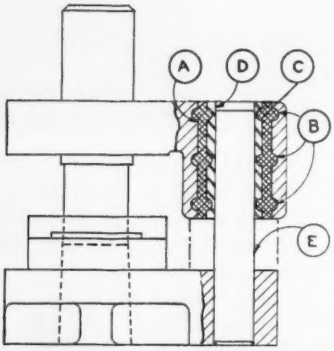
A Quick and Inexpensive Method of Aligning Dies in Die Sets

By John A. Honegger

In assembling dies in die sets, it is the usual practice to set up a punch press for a stamping job by fastening the die in position with the punch in the die, then clamping the punch to the ram and doweling it. In many cases this task takes up a considerable amount of time. Recently the writer was required to set up a press for a rush job, and in order to save as much time as possible, he performed the task in the following manner.



Drawing illustrating method of aligning a die by the use of matrix metal.

First, he pressed out the liner pin bushing and drilled the bushing holes out to ¼ inch larger than the outside diameter of the bushing, as indicated at A in the illustration. Three grooves were then cut around the inside of the hole, as shown at B. In the outer surface of the bushing he cut three grooves C to correspond to the grooves cut in the inside of the bushing hole. This done, two spacer bushings of the correct height were made and slipped into position over the pins E.

The die was then located in position in the press, and anchored with dowel pins in the usual manner. The punch was also positioned and doweled. Shims were then placed between the punch and die to centralize the punch, after which matrix metal was heated and poured in and around the bushing in the space between the bushing and the punch holder. The matrix metal solidified very quickly and the die was ready for production.

Perfect alignment was secured and the job was done in a fraction of the usual time of setting up a press. Thousands of blanks have been turned out with this die and the alignment is still good.

An Efficient Commutator Conditioning Machine

By S. J. Raetz

In the maintenance shops of the Independent Subway System, New York City, probably the one maintenance operation which comes closest to being a production job is that of reconditioning the commutators of

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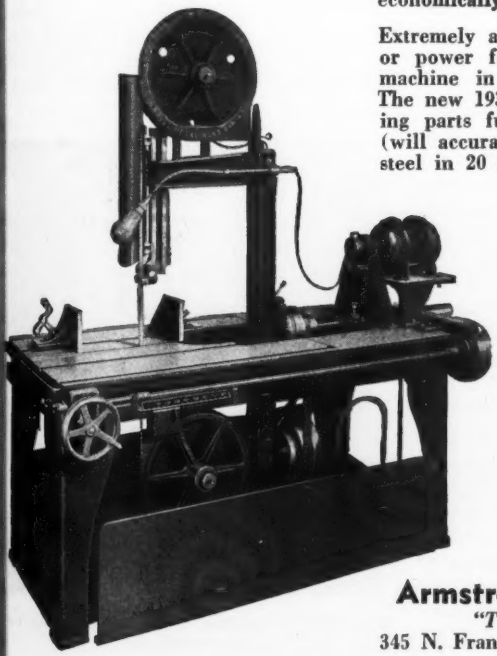

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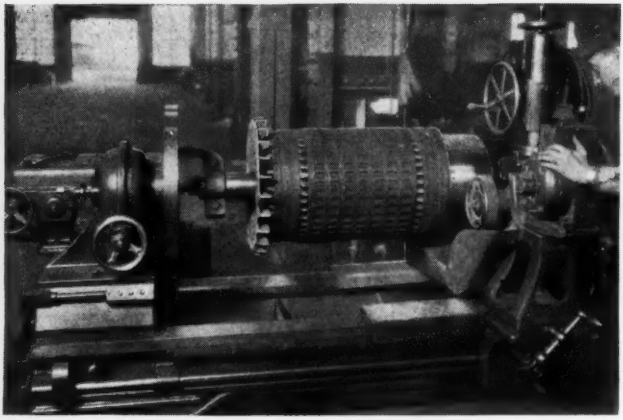

Fig. 1—Polishing the commutator on a subway train motor.

the armatures of the electric motors which drive the subway trains. Although of the best make obtainable, many of the motors are in practically continuous service of the most gruelling nature. As a result, the motor commutators become worn and grooved, and periodically each motor is taken to the shops to be reconditioned.

The machine that is used for the reconditioning job is shown in operation in the photograph herewith. Designed and built by the Columbia Machine Works & Malleable Iron Company of Brooklyn especially for the job, the machine resembles, in principle, an engine lathe. The work is held between headstock and tailstock centers and is driven by a dog and faceplate in the usual manner.

An interesting feature of the machine is the speed control mechanism, which consists of a Lewellen Variable-Speed Transmission. By turning the handwheel at the front of the comparatively small headstock, the operator can obtain any speed desired—and the correct speed is highly important on this job.

The carriage somewhat resembles the conventional lathe carriage, but in place of a tool-rest the carriage is equipped with a Hisey-Wolf 1-h.p. grinding attachment for a lathe, blocked up to an approximate level with the machine centers and provided with a vertical adjustment. Contact of the wheel with the work is obtained by the carriage crossfeed. Instead of a grinding wheel, the attachment is equipped with a C. B. Hunt & Sons "Quick-As-Wink" cushian abrasive wheel, 8 inches in diameter. The periphery of the wheel consists of a rubber cushion ½-in. thick supporting a band of abrasive cloth.

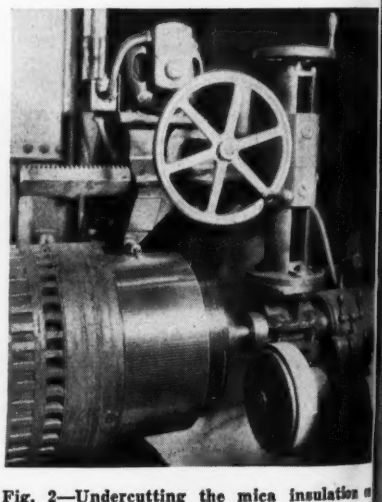

Fig. 2—Undercutting the mica insulation on the commutator.

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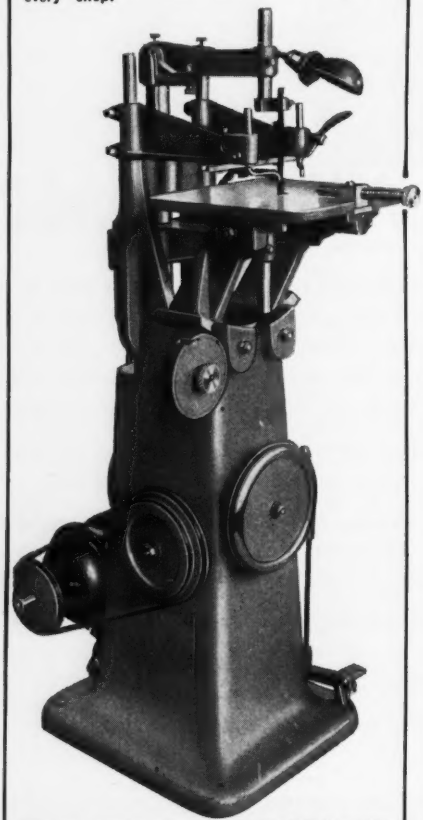

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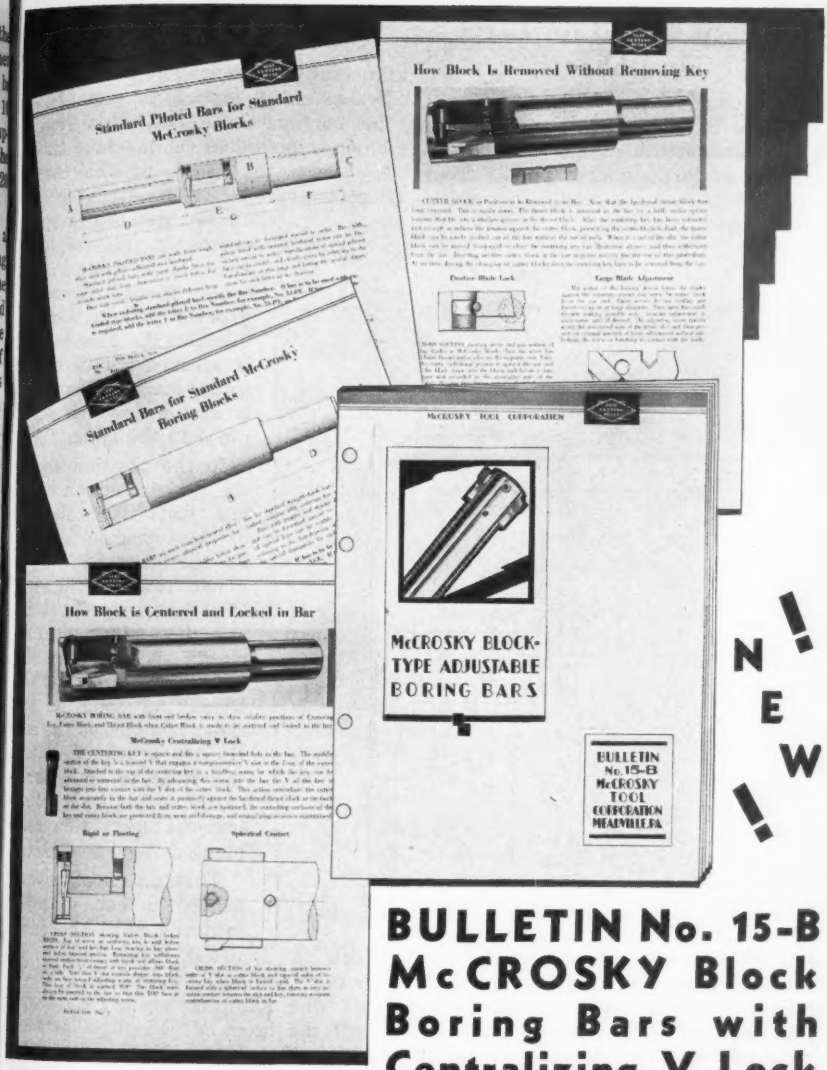
The wheel is so constructed that the abrasive belts can be changed when necessary and a new belt can be locked in place on the wheel in 1 seconds. The abrasive belts are supplied by the manufacturer of the wheel, and any grain from 24 to 32 may be obtained.

With the armature revolving at a slow rate of speed, the polishing wheel is fed into contact with the copper segments of the armature and the machine feed is engaged. The polishing wheel runs at a speed of 3,000 r.p.m. If the commutator is badly worn, two roughing cuts and a finishing cut are taken, the first cut removing approximately 0.025 in. of stock, the second, 0.005 in., and the third, 0.001 in. The first two cuts are taken with No. 80 abrasive cloth and the last with No. 180. If the job is not so badly worn, it may suitably be reconditioned with two cuts.

After the commutator has been polished to the required smoothness, the mica insulation between the copper segments must be machined down below the surface of the commutator to prevent interference with the brushes as the armature revolves. This operation is performed with a motor-driven milling attachment, shown in operation in Fig. 2.

The milling attachment, as can be seen by reference to the illustration, is attached to the tailstock spindle but is sufficiently rigid for the work. An operating unit on a horizontal rack carries both the motor and the spindle upon which the 1/32-in., ⅞-in. diameter saw revolves, the cutter spindle being driven by belt from the motor. Hand feed is provided by a pinion that engages the rack and is controlled by means of a handwheel. With the dog at the headstock end released, the armature can be adjusted by hand for the consecutive cuts between the segments.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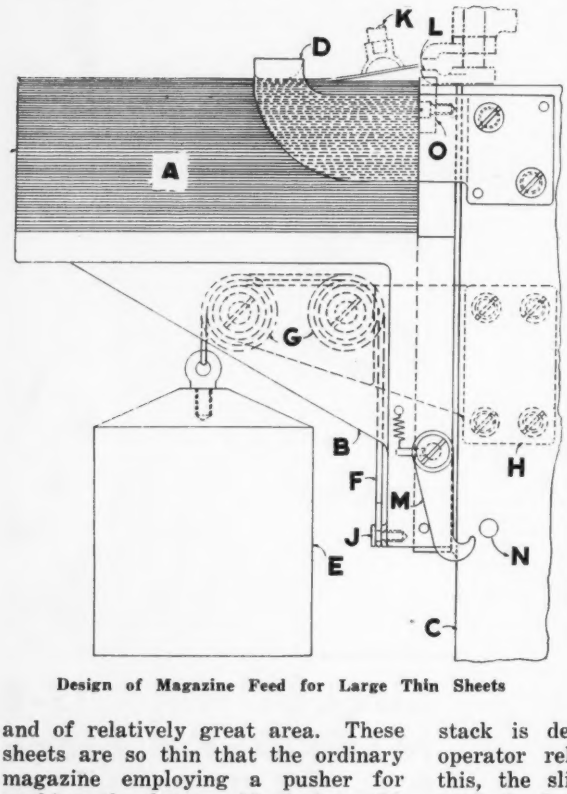
Magazine Feed for Large Thin Sheets

By J. E. Fenno

ONE of the operations in the manufacture of fire-proof doors consists of forming door panels from steel sheets that are 0.0017 inch thick and of relatively great area. These sheets are so thin that the ordinary magazine employing a pusher for pushing the bottom blank into the machine would be inadequate. With the magazine feed illustrated, however, the sheets are taken from the top of the stack; thus, regardless of the variation in thickness of various sheets, the top sheet will always be located at the same height relative to the feeding fingers that carry the sheets into the stamping press.



Design of Magazine Feed for Large Thin Sheets

The sheets, indicated as A in the illustration, are loaded onto the vertical slide B, which is mounted on the machine C. A stationary stop D, which is bolted to the machine frame, holds the top sheet at the correct height and the entire stack is held up against this stop by means of the weight E attached to cable F. The cable passes over the grooved pulleys G on the bracket H. The bracket is anchored with screws to the machine frame and is secured to the screw pin J in the slide.

In the position shown, the rubber suction cup K has just lifted the end of the top sheet so that, as the transfer fingers move toward the left, they will grip the blank and then carry it to the right and between the upper and lower die sections. As soon as this sheet has passed the stop D, the weight E causes the slide to rise, as already explained, bringing the next successive blank up against the stop.

This movement is repeated as each sheet is removed until the entire stack is depleted, after which the operator reloads the slide. To do this, the slide is pushed downward until the latch M, which is attached to the side of the slide, can be hooked over the pin N which protrudes from the side of the machine. This holds the slide stationary in its loading position. When the slide is loaded, the latch is released and the slide is allowed to rise, carrying the top sheet up against the stop.

The block **O** serves an important purpose. Anchored to the machine frame, it prevents more than one sheet at a time from leaving the stack, which would be likely to occur if the friction between the sheets were excessive.

The weight **E** should not be greater than is necessary to hold the sheets snugly against the top **D**, otherwise the grip of the fingers **L** will have to be correspondingly greater and since the material of which the blanks are made is relatively soft, a tight grip would mar the surface of the material.

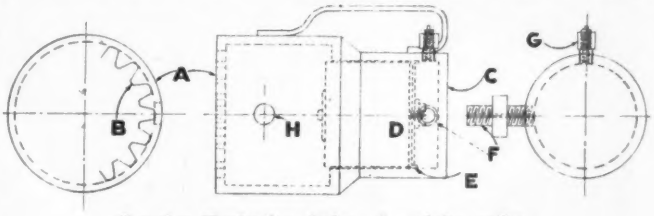
Hydraulic Pinion Puller

By Michael Axler

THE drawing shows the principles of design of a hydraulic pinion puller which was especially designed for use in removing the pinions from the armature shafts of subway car motors. When these pinions are first assembled to the shafts, they are expanded by placing them for a short time into a tank of boiling water or oil. When sufficiently heated, they are driven onto the taper on the shaft and locked in position by tightening a heavy nut on the end of the shaft. As the pinion cools, it contracts and when cold is very difficult to remove from the shaft.

Previous to the development of the tool shown here, it was customary to remove pinions by driving steel wedges between the face of the pinion and the housing, at the same time heating the pinion by means of a small circular pipe gas heater. As the pinion expanded, due to the heat, the wedges were driven in until the pinion was finally loosened. This method consumed gas, time, and hard labor.

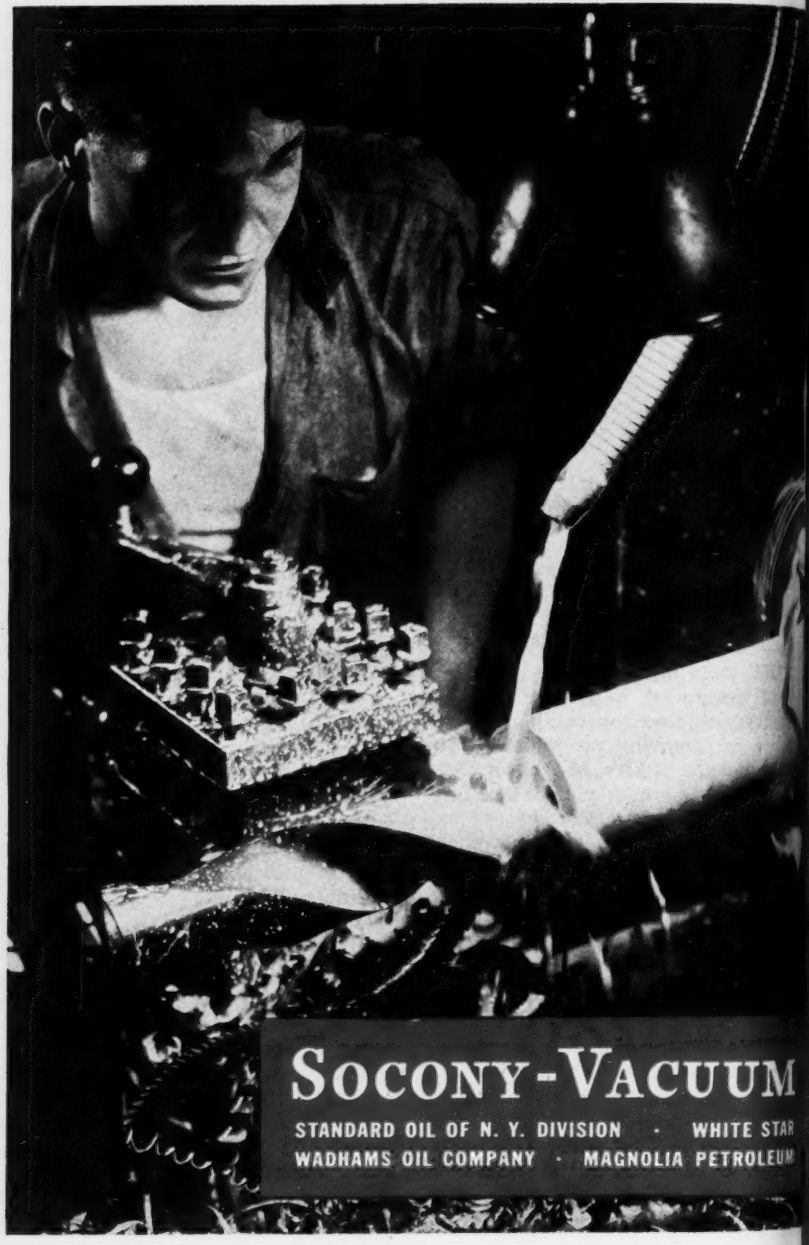
The hydraulic pinion puller shown consists primarily of a cylinder that grips the pinion while the piston, actuated by hydraulic power, forces the cylinder and piston off the shaft.



Drawing illustrating design of a pinion puller.

At the end of the body of the puller **A** is a row of internal teeth of the same pitch as the teeth on the pinion and approximately ½ inch wide on the face. The circle upon which these teeth are cut is of the correct size so that, by meshing the teeth of the puller with the teeth of the pinion, the puller can be slipped over the pinion until the teeth of the puller have cleared those on the pinion. Then the body of the puller is revolved slightly, bringing the teeth of the two parts into alignment. The relative positions of the teeth can be determined by looking through the hole **H.**

With the teeth of the two parts properly aligned and the end of the piston **D** in position against the end of the armature shaft, the hydraulic pump is started. The oil enters the cylinder through the inlet pipe **F,** expanding the leather cup **E** against the wall of the cylinder and forcing the piston against the end of the shaft while the cylinder slowly pulls the pinion free from the shaft. When the puller and pinion have been re-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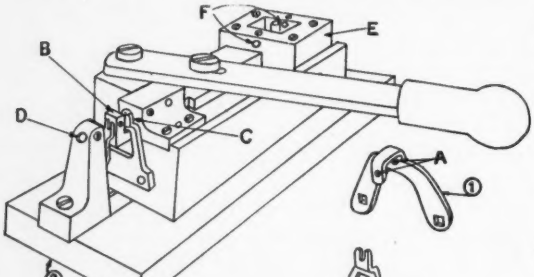
moved from the shaft, the pinion can easily be slipped out of the end of the cylinder. A different puller is required for each different size of pinion, but most of the pinions are of a standard size and pitch.

Bench Punching Fixture

By C. H. Willey

HAVING a large quantity of small brass parts to make, similar to the design indicated as Fig 1 in the drawing, we decided that it would be more economical to design a special bench fixture for the job than to make a set of dies for a standard punch press. The part is made of 0.002 in. semi-brass and the specific operation under discussion consisted in punching the two holes indicated at A.



Design of small bench punching fixture for punching two holes in the part illustrated as Fig. 1.

The punching fixture, Fig. 2, consists primarily of the base, the sliding part to which the hand lever is attached, a double end punch carried in the L-shaped part B, and the die holders C and D. The box-like part E, through which extends a pin that is anchored in the base, limits the travel of the ram in either direction. Stops extending through the holes F may be set to limit the movement of the ram so that the punch will not travel farther than is necessary to pierce the metal, thus providing for easy stripping.

To use, the formed section of the part, Fig. 1, is placed over the top of the block B and the slide is moved first in one direction and then in the other, piercing the two holes in sequence. Strippers of the design shown in Fig. 3 are attached to the fixture body to strip the piece from the punches after the holes have been punched. A stroke forward and back is all that is required to quickly punch the two holes in alignment, and a girl operator can punch these pieces at the rate of 700 pieces an hour.

Chuck Hoist Saves Both Chuck and Machine

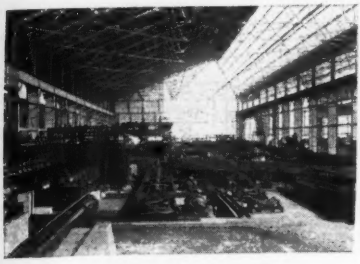
By C. F. Fitz

ONE of the most common sources of danger to the mechanic's hands and fingers is the common practice of trying to hold a lathe chuck with one hand while the other is used to pull the belt when running the chuck onto the spindle or removing it from the spindle of the lathe. Countless fingers have been smashed and countless lathe ways have been badly nicked by this procedure.

In order to make the job of changing chucks easier and at the same time eliminate danger to the machine, the chuck, and the workmen's fingers, we designed and built the hoist shown in the drawing. The frame was made from 2-in. double-walled pipe, joined together with the usual pipe fittings

Giving Steel the Push-Around

In a modern steel tube plant, cherry-red ingots are pushed from furnaces—pushed to the rolls—pushed up and tipped over—the ever changing shape travels the length and width of the plant—always pushed by powerful plungers.



"Vulcan's Keyboard"

These plungers dart out from their sleek cylinders, do their work, withdraw to dart again. Scores of air cylinders—they lurk in hidden places, always to discharge an irresistable plunger at the harried steel. At a central station sits the operator, pulling little levers—a cheerful Vulcan casting thunderbolts.

The little levers are on air valves—most likely Ross Operating Valves. Each valve controls a certain cylinder—controls it accurately, dependably. Depress the lever and some remote plunger leaves its cylinder on the instant to apply power somewhere. Throw the lever back, that remote plunger returns to its kennel. Flip the lever up, the valve finds its neutral instantly—the plunger is at rest. All the multiplicity of operations are air actuated and that's been found to be most efficient, least expensive, quickest, if the air is properly controlled. Ross Valves insure positive control.

He Sought a Bridle

In 1920, C. A. Ross was engineer in charge of construction of a seamless steel tube plant in Detroit. The war was over—the war that had speeded up mechanical production processes, had made thousands of machines obsolete. He recognized air power as best for many of the most important operations in the new mill—air was powerful, made speed possible.

So he sprinkled the plant with air cylinders—then sought an improved device to control the monster to be imprisoned in them, a better valve than was then available. He had the horse, he needed a bridle.

That's how he came to devise the operating valve that since then has borne his name. A battery of them was installed on an operating panel, where a genial technician still plays with them, as an organist with keys, unleashing thousands of horsepower in one place, withdrawing it in other places.

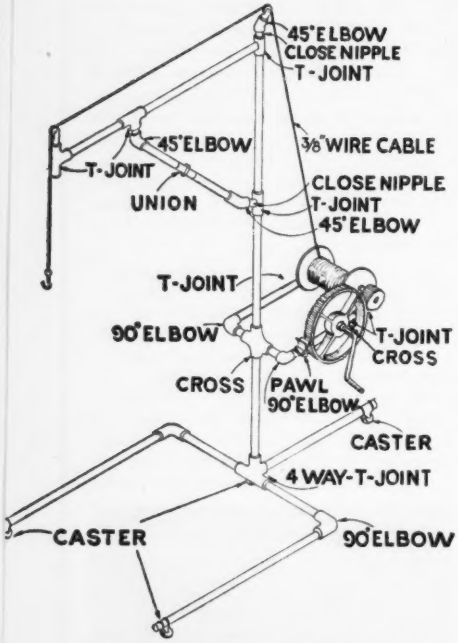
Other plants heard of the new valve—"the bridle for air horsepower"—and soon all manner of industries were using the Ross Valve for controlling air cylinders on everything from the smallest air vises to giant presses. There's more than one model now—hand, foot or solenoid controlled, for operating single or double acting cylinders. There's a type for every air controlled operation in industry—new applications are being discovered every day.

"—he had a horse"

They're made (in a plant that makes nothing else) by the Ross Operating Valve Company at 6488 Epworth Boulevard in Detroit, Michigan.

of malleable iron, as shown.

The fittings below the diagonal cross-arm are locked in place, after assembling, with 3/16-in. taper pins, which prevent them from turning on the pipe under a heavy load. The drum-shaft and shaft upon which the large gear operates are positioned in



Hoist for Handling Lathe Chucks and Milling Machine Attachments

babbitt bearings with oil-holes, and the reversible pawl is attached to the pipe with a shouldered cap screw. The size of the hoist can be determined according to the work in hand.

The hoist is so convenient to use that the workmen now use it not only for handling lathe chucks, but also to handle index heads and other milling machine attachments, heavy work, and so on. Casters are easily attached and make it possible to move the hoist about the shop.

PERMITE 6-FT. CAST BRONZE BARS. Valuable data on the uses and properties of various bronze alloys have been collected and published by Joseph T. Ryerson and Son, Inc., Chicago, as part of their new 26-page booklet on Permite Six Foot Cast Bronze Bars, which will be sent on request to purchasing and production men. The section devoted to physical properties covers such subjects as wear resistance, coefficient of friction, machinability, tensile strength and hardness of many alloys. Graphs show the behavior of the alloys as contents of different metals are altered.

The booklet also shows, with the aid of photographs, the steps necessary in the production of finished parts from individual castings, from short bronze bars and from Permite Six Foot Bars. Case histories are included, in which costs and production time are compared. The Permite Bars, the booklet states, assure a product identical in physical and wear resisting qualities with the finest individual castings.

DURO-BRACE TEXSTEEL SHEAVES FOR TEXROPE DRIVES are described and illustrated in a 16-page booklet which is being distributed by Allis-Chalmers Manufacturing Co., Milwaukee, Wis. The design and construction of the sheaves are described in detail and drawings are included which will assist the prospective user in adapting these sheaves to his transmission problems. The booklet contains several pages of specifications. Copy free upon request.

LANGLOIS PRECISION GAUGES: Descriptions and illustrations of the plug and ring gauges, chromium plated gauges, gauging fixtures, special gauges, and master gauges made by the Langlois Grinding Company, Inc., 1604 23rd St., Detroit, Mich., are included in this 12-page booklet which has been issued by the above firm. Specifications for the various sizes and combination of sizes are included together with prices. Copies free upon request.

MILLER FALLS ELECTRIC TOOL CATALOG: The Miller Falls Company, Greenfield, Mass., has issued Catalog No. 4, in which are illustrated and described the line of Electric Tools made by this firm. New tools shown in this catalog are a High Speed Grinder, a light Adjustable Screw Driver, 3/8-in. Special, 1/2-in. Special, and 1-in. Standard Drills and two Bench Grinders. A copy of this catalog can be secured free through their distributors or direct from the Miller Falls Company.

SUPER DUTY
SUPERIOR CUTTING TOOLS
Assuring Production Economy
"We have tried out the SUPER-DUTY files sent in by the .... and find them far superior to the files we are now using."*
A very great deal said in a few words—by a user who is well able to buy with regard to initial price only. However, they wisely base their purchases of files upon performance and the ultimate or true cost.
Your production, also, for cost conservation, merits SUPER-DUTY quality.
* A direct quotation from a report to the purchasing department of one of the four largest users of files in the U. S., made by the Tool Supervisor.
Specify SUPER-DUTY files from Your Mill Supply Distributor.
THE CLEVELAND FILE CO. U.S.A.
SPECIFY
SUPER
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EXCLUSIVE MFRS.
QUALITY FILES SINCE 1899

Over the Editor's Desk

This Month

AGAIN we are privileged to present, for the benefit of those of our readers who are interested in the subject, a story of modern apprentice-training methods. Our feature article this month comprises an outline of the apprentice-training methods in use at the plant of the Newport News Shipbuilding and Dry Dock Company, where the product consists of ocean-going steamers, passenger liners, battleships, cruisers, airplane carriers, and other salt water craft.

If there be any romance in modern industry, it is most evident in a shipyard. The building of ships has always been a romantic vocation, and it is none the less so now that ships are constructed of metals instead of the wood of the forests. Instead of turning out finished units in quantities, each just one more product that has been a part of the day's work, the craftsmen in a shipbuilding plant see the huge vessel grow day by day until, after weeks and months of machining and cutting and fitting, the product of their skill glides down the ways and rides gracefully upon the surface of the water.

The young men who are given the opportunity to obtain such training, in such a plant, are to be congratulated upon their good fortune.

Did You Order Your Copy?

LAST month we announced that we were contemplating publishing C. L. Szalanczy's series of articles on "Punch Press Operations and Tools" in the form of a book, to be approximately the same size as this magazine, and to sell at one dollar. In order to obtain some idea as to the number of copies that should be ordered from the printer, we asked all who want the book to send in their reservations now.

The response has been very gratifying indeed, but we want to gauge our requirements as accurately as possible, so as to plan on ordering only as many as there will be a call for. The orders will be filled in the order of their receipt, so we suggest again that you make sure of your copy by placing a reservation for it now.

Cleanliness, Godliness, and Safety

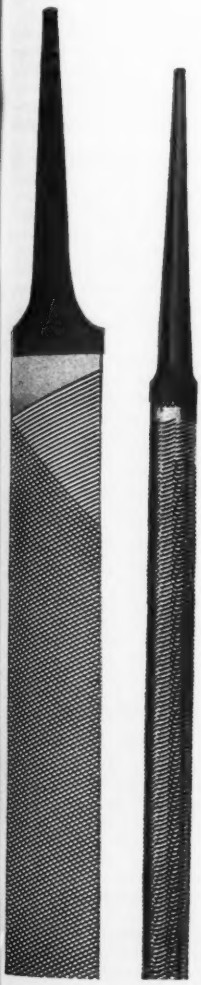
CLEANLINESS, according to the well-known phrase, is next to Godliness, but Safety is next to Cleanliness. Your editor has never seen this fact more clearly demonstrated than at the Pennsylvania shops at Columbus, Ohio. The orderliness of the material in process, the cleanliness of the floors, and the spick-and-span appearance of the machines are in pleasing contrast to the traditional grime which is ever yet characteristic of some of the shops throughout this country.

Cleanliness costs money, it is true, but it saves more than it costs. There was a time when anything more than a frequent sweeping of the floor and a half-hour's wiping of the machine on Saturday afternoon was considered a waste of time, but those days are apparently gone forever, for which credit can be given to the Safety Movement. Safety means orderliness, and orderliness means cleanliness. Safety is good business.

FILES WITH METAL SAW TEETH

"A Revolutionary Idea in File Making"

Announced and first put on the market less than two years ago.



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RED TANG

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Today their greater cutting efficiency and longer wearing qualities have won general recognition in mills, shops, and factories for this major improvement in File manufacture.

Use Red Tang Files. Ask Your Dealer For Them.

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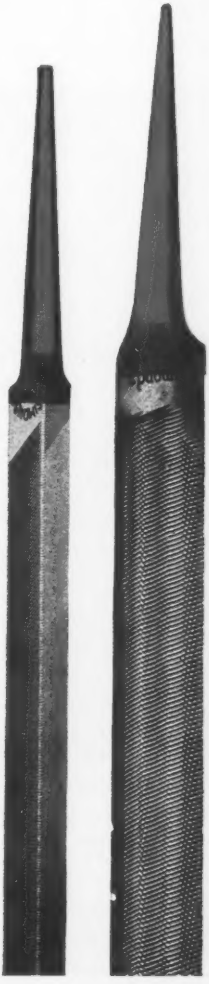


New Shop Equipment

Principles of Modern Industrial Design Applied to New Farrel-Birmingham Press

Farrel-Birmingham Company, Inc., Ansonia, Conn., announces a new design of hydraulic press with a self-contained hydraulic power unit using oil as the fluid medium. The press is designed

Farrel-Birmingham 100-Ton Hydraulic Press

especially for plastics and rubber molding operations although readily adapted to other work. It is of 100 tons capacity and has platens 20-in. square, with an opening of 12-in. between platens.

The variable displacement pump with its driving motor is mounted on a steel bedplate over the top crosshead, the crosshead also serving as an oil reservoir. Steam and oil pressure gauges are mounted in a white enameled depression on the front face of the top crosshead, behind a protective shatter-proof glass, and are illuminated by indirect lighting. The usual tie rods between the top and bottom crossheads are dispensed with and, instead, rolled steel slabs are used as tension members. These slabs are finished to fit machined tongues that project from the top and bottom crossheads and adjustment is provided by means of patented adjustable tapered keys.

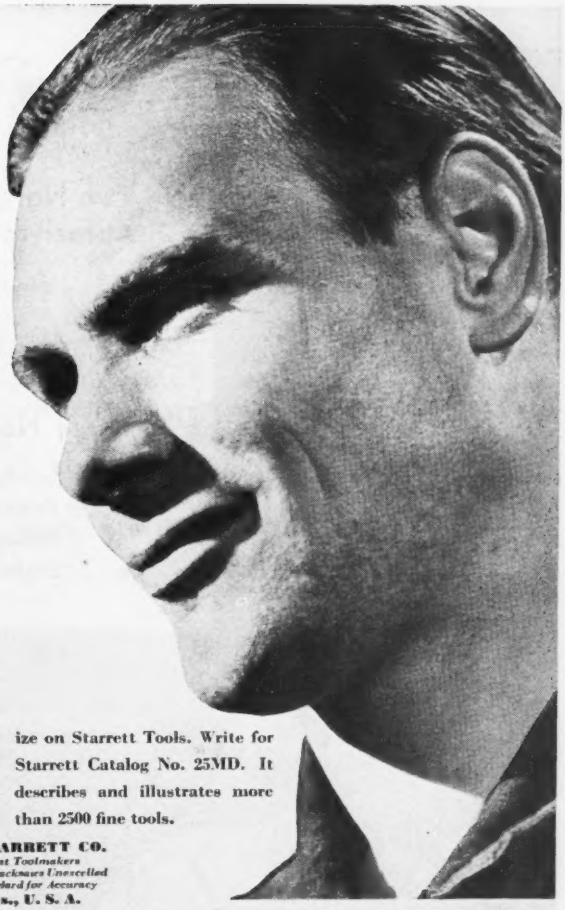
The bottom crosshead is integral with the cylinder, which contains the hardened and polished ram. Interposed between the steam platens and the crossheads are ventilated grids, to lessen heat transfer from the steam platens to the crossheads. Steam connections are provided for the upper and lower platens with suitable clearance for their operation provided in the slab tension members.

The operation of the press requires the opening or closing of but one valve and maximum pressure adjustment of the variable displacement pump may be made by a single manipulation of the control hand-wheel on the pump. This pressure adjustment, however, requires no attention once it has been set for the correct value for any particular operation.

In line with the modern trend in industrial design, the appearance of this press is pleasing to the eye, as all component parts that are not functional in the actual operation are enclosed, although readily accessible for inspection and maintenance purposes.

South Bend 9-In. "Workshop" Lathe with V-Belt Drive

The South Bend Lathe Works, South Bend, Ind., announces that V-belt drive is now optional on the new 1936 9-In. "Workshop" Precision Lathe. When equipped with a V-belt drive, this lathe is driven by means of a single V-belt from the countershaft to a four-step cone headstock. This transmission provides eight spindle speeds; four on open belt and four in back gear, the speeds ranging from 44 to 585 r.p.m. The V-belt drive can be obtained only with

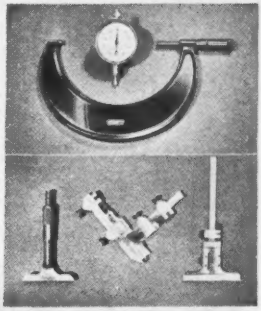


"You might as well ask a man to work blindfolded as to give him tools he's not sure of. He certainly can't do his best work if he has to worry about every measurement he makes. That's one thing about Starrett Tools — most machinists have been brought up with them. That's why we always like to get Starretts when we check tools out of the crib.

Your men do better work and do it faster when they work with tools they know and trust. That's why it pays to standardize on Starrett Tools. Write for Starrett Catalog No. 25MD. It describes and illustrates more than 2500 fine tools.

THE L. S. STARRETT CO.
World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
Steel Tapes—Standard for Accuracy
Athol, Mass., U. S. A.

YOUR MEN *Prefer*
STARRETT
TOOLS



6575

Cutting

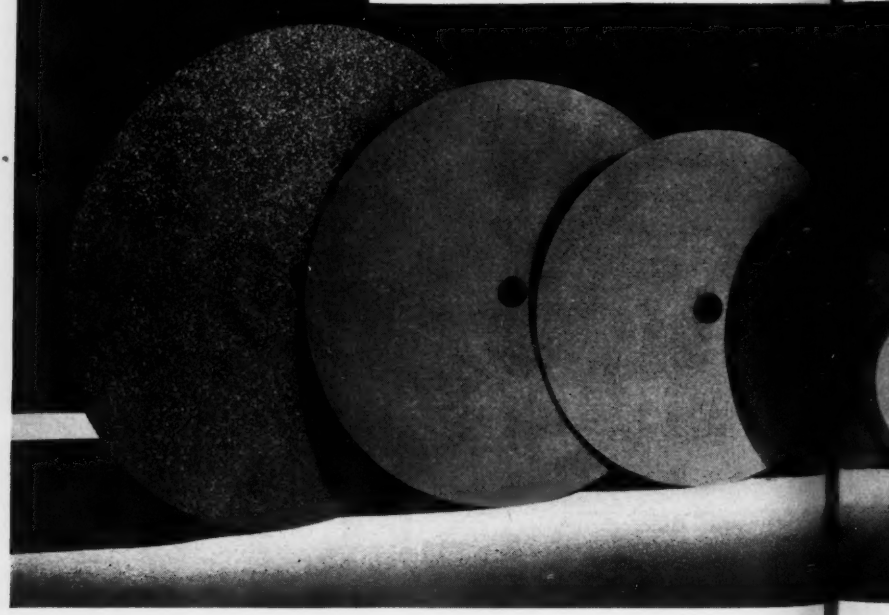
Two Norton Abrasives . . .

Alundum

Crystolon

Three Norton Bonds . . .

Bakelite
Rubber
Shellac



...t-off Costs

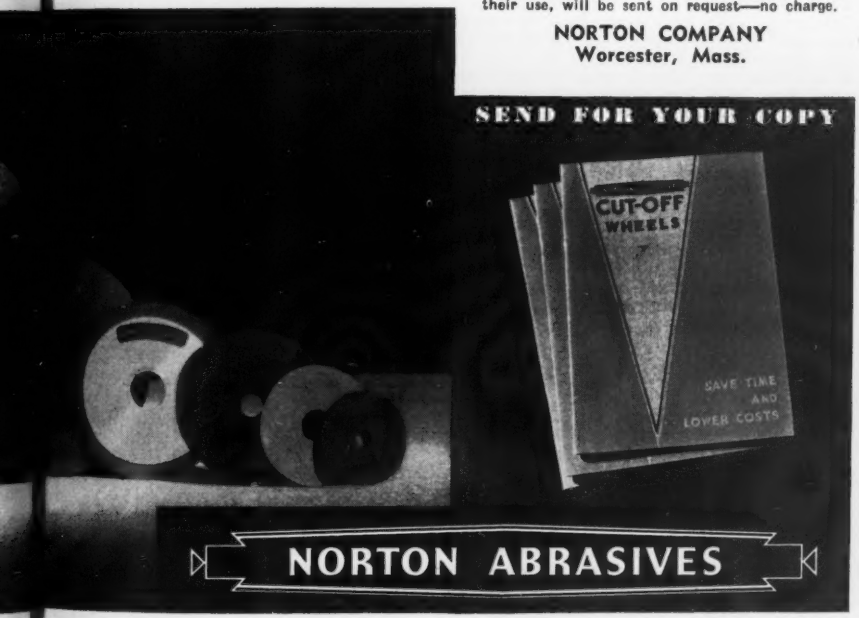
SPINNING disks with millions of tiny cutting teeth—teeth that fairly eat their way through tough metal, hard stone, brittle glass and countless other materials, through solid bars, tubing, slabs and special shapes. Are you taking full advantage of Norton Cut-off Wheels—are you letting them cut your cut-off costs?

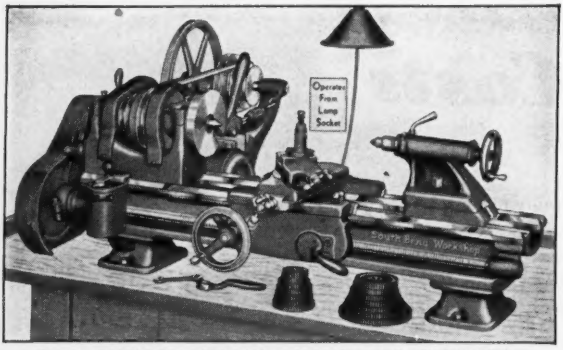
There's a complete line of Norton Cut-off Wheels—from husky brutes for slashing through stone to paper-thin disks for slitting pen points. There are wheels for high speed operation or slow speed, for wet cutting or dry.

And to help you select the right wheel to solve your problems there are Norton field engineers—men who specialize on cut-off work. Their experience is available for the asking.

The booklet illustrated below, giving full information about Norton Cut-off Wheels and their use, will be sent on request—no charge.

NORTON COMPANY
Worcester, Mass.





South Bend 9-In. "Workshop" Lathe with V-Belt Drive

the adjustable type countershaft, however, the adjustment being necessary to permit shifting of the belt from step to step on the cone pulley. This improvement is said to make the small lathe particularly suitable for production work in manufacturing.

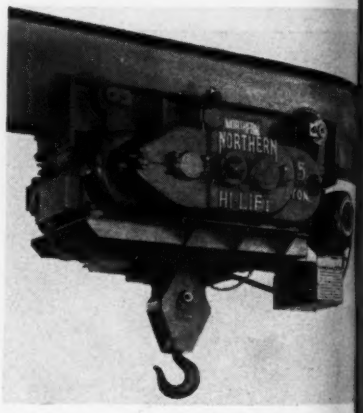
In addition to the V-belt drive, the 1936 Model 9-In. "Workshop" Lathe features ten new improvements including the new twin gear reverse for right and left hand threads and feeds, a ball thrust bearing on the headstock spindle, larger spindle bearings, and so on. With a bed cast of 50 per cent steel and 50 per cent nickle iron, the lathe is said to be strong and rigid and the manufacturer states that all alignments come within a tolerance of 0.001 in. The lathe is available in four bed lengths; 3 ft., 3½ ft., 4 ft. and 4½ feet.

Northern Hi-Lift Hoists

A roller bearing electric hoist designed so as to provide extra head room, illustrated herewith, has been brought out by Northern Engineering Works, Detroit, Mich. The hoist is designed to allow the use of standard parts in many different combinations which, together with the many variations of rolled steel frame construction available, make it possible to form a hoist which will meet the user's special requirements. The hoist frame is constructed of rolled steel shapes, which form a simple, rigid structure, insuring the maximum of safety and guaranteeing permanent alignment of all mechanisms.

The hoist is powered by a standard NEMA frame, foot-mounted motor with standard shafts, no special heads, shafts, or mountings which might interfere with quick servic being used. Stand heavy duty r bearings are throughout the h and travel mech ism. The ho gear case is slip horizontally thro the bearings to al for inspection and removal of the g ing and mechani brake without t necessity of drain the oil from the ca The hoisting gear are standard machi cut steel spiral ty gears, hardened heat treated. T hoist is equipped with two brake powerful automatic disc type mechani load brake is provided in the hoist mec anism and an electric motor brake is fu nished on the hoist motor. The elect brake is not dependent upon the cond mechanism or other mechanical devi

All hoist gears, bearings, and the m chanical brake are enclosed in



Northern Roller Bearing Hi-Lift Hoist

tight gear housings and are lubric by a bath of oil. Outside bearings Alemite lubricated.

Clearing Duplicator

The illustration shows a horizon boring machine equipped with a Clear Duplicator. The Duplicator, a prod

NO SPRINGS—*That's one reason for this* DOUBLE *Solenoid* CONTROL VALVE *for High Speed Service*

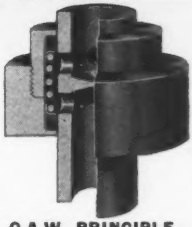
Even tho the makers will not guarantee solenoids, this combination makes both solenoids and valve highly efficient and assures long life to the solenoids themselves.

Momentary Contact!

ASSURES SATISFACTORY SERVICE

Here's Why

Solenoids **ONLY MOMENTARILY** energized for valve action or reversal. No springs.
Minimum current consumption. Minimum coil heating. Current "time on" lowest possible, permitting high speed reversals without undue heating. High speed of operation obtainable.
Safe—no energizing when not in action—eliminates solenoid burn-outs.
Operated by heavy duty normally open push buttons or similar automatic control.
Solenoids and valve cage removable without interfering with piping.
Send for Catalog 1M—mention applications.



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No metal to metal wear—short travel—inherently balanced. Gives millions of care and trouble-free operations without repair—guaranteed against leakage.

MOST COMPLETE LINE OF AIR OPERATING VALVES IN THE WORLD

Quick-As-Wink Control FOR AIR VALVES FOR WATER

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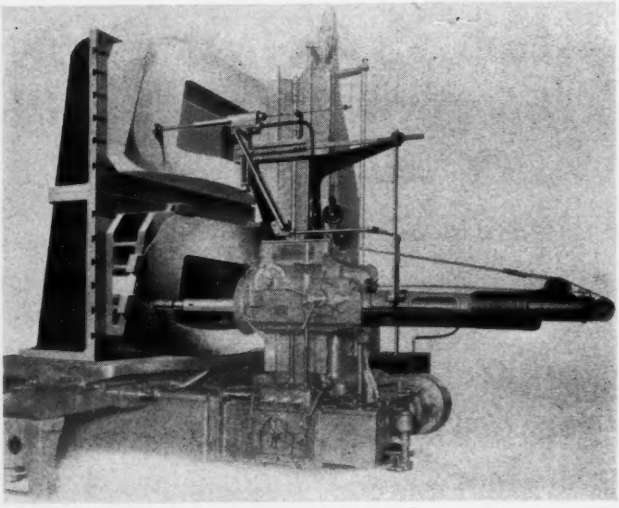
DISTRIBUTORS IN PRINCIPAL CITIES

Representative in England: Gaston E. Marbaix, Ltd., London



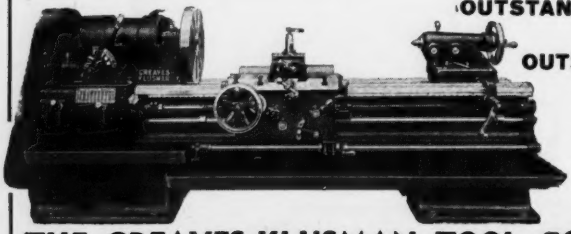
Clearing Duplicator

of Clearing Machine Corporation, 6499 W. 65th St., Chicago, Ill., can be used with any standard milling machine, vertical or horizontal type, for the production of irregular shape die sinking or duplicating work without interfering with its milling operations in any way. It gives the milling machine the use of its full working range in any direction and does not have to be removed when the machine is again required for regular milling work. It is so designed that it can either bring the cutter to the work or the table with the work to the cutter.

To provide for duplicating, the attachment is provided with a tracer arm which, in operation, is attached to the side of the milling machine and carries an adjustable ali at the end which is mount the tracer he An assortment rubber and alu num tracer t are supplied f the head. With tip in the he the milling m chine table car ing the work a the extension c rying the mod are raised un the tracer contac the model and t cutter contacts t work. Power then applied au by hydraulic pr sure control, t movable table a tomatically follo the tracer again the model impa ing a correspon ing movement the work where engages the cutting tool.

The Duplicator is equipped with safety mechanism which prevents t cutter from running into the table the machine.

The Clearing Duplicator can be set f fast roughing cuts or for an accura within limits of 0.002 in., resulting a minimum of hand finishing on ev the most exacting jobs. Micrometer adjustments in three directions are pro vided, together with push button con trol. The Duplicator is furnished com plete with the tracer arm, slide, adjus able tracer head and tips, oil tank, mo tor, control pumps, oil pan, necessary piping and connections, hydraulic lin with fixtures, and electric push button control.



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OUTSTANDING FEATURES
G. K. Single Lever Control Lathes will give you the production efficiency you want on your lathe work. Write for catalog describing complete details.

THE GREAVES-KLUSMAN TOOL CO., Cincinnati, O.

Test THE ADVANTAGES

Everybody is trying these NEW FILES . . .

In industrial plants throughout the country, mechanics are trying the NEW FILES—finding for themselves why the latest development by the Nicholson File Company is rapidly being acknowledged the greatest improvement in file manufacturing in a generation.

When you try this NEW Product notice how reserve cutting edges go to work as old ones wear down—a feature no one believed possible until Nicholson File experts discovered a new method of tooth construction.

For greater durability, extended file life and prolonged usefulness are the results of this new feature. See for yourself how the NEW FILES lower filing expense in your factory. Mill supply dealers have complete stocks of the NEW FILES. Nicholson File Company, Providence, R. I., U. S. A.

NEW METHOD OF MANUFACTURE AND TOOTH CONSTRUCTION FULLY PROTECTED BY PATENTS PENDING

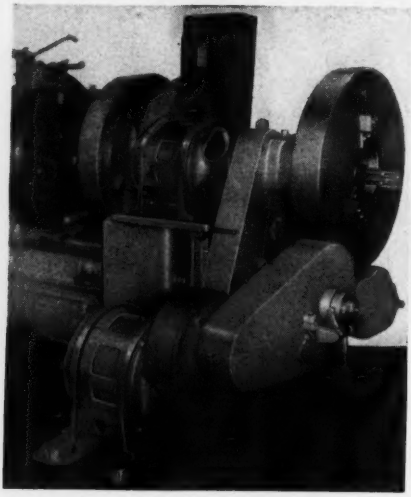
A File for Every Purpose

Produced in the 3 Leading Brands

NICHOLSON • BLACK DIAMOND • McCAFFREY

Landis Speed Arrangement For Threading and "Bucking Up" Tool Joints

The illustration shows a dual speed arrangement which has been developed by the Landis Machine Company, Waynesboro, Pa., for use in connection with the



Landis Pipe Threading and Cutting Machine with receding chaser die head equipped with dual speed arrangement for "bucking-up" tool joints on drill pipe.

Landis Pipe Threading and Cutting Machine with receding chaser die head for "bucking-up" tool joints on drill pipe used in the oil fields.

As will be noted from the illustration, two motors are employed. This machine is regularly equipped with a 1200 r.p.m. motor which provides spindle speeds through the gear box ranging from 8 28 r.p.m. for the thread cutting. T second motor is also a 1200 r.p.m. mo with geared head for 260 r.p.m. to p vide a spindle speed of 2 r.p.m. "bucking-up" tool joints.

For driving the machine at threadi speeds, a friction clutch is used, where a tool clutch is used for the slow spee When either motor and its clutch are operation, the other motor and clut remain idle. Separate clutch levers a provided on the machine for engagi the proper clutch.

A three-station push button control employed. One station is used to star the threading motor, the second statio is used for the slow speed motor, and the third station for stopping the machine. The switch is so wired that it is impossible to start the two motors simultaneously. The slow speed and positive drive provide ample power to insure pulling a tight joint.

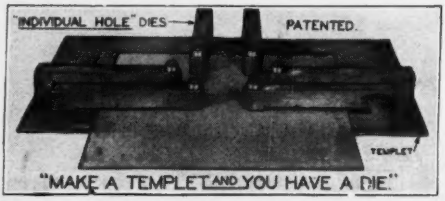
Motorized Variable Speed Transmission Announced by Link-Belt

The Link-Belt Company, 2045 W. Hunting Park Ave., Philadelphia, Pa., announces that in order to meet the growing demand for still greater range and flexibility of application, certain features of design have recently been incorporated in its P.I.V. Gear variable speed transmission, which will permit the entire line to be furnished in the following combinations and sizes: (1) motorized (when desired), with motor forming an integral part of the unit; (2) with or without speed reduction gearing; (3) with horizontal or vertical box; (4) in 5 sizes up to 15 h.p. capacity.

Previously, P.I.V.'s were available in sizes up to but 10 h.p., with horizontal box only, and without reduction gear sets or the integral-motor feature. The

WALES ADJUSTABLE HOLE PUNCHING DIES

Why spend money for perforating dies when you can shift these "INDIVIDUAL HOLE" dies around to punch almost any arrangement of holes in flat parts!



You can be in production the same day you first see the print of a part.

Punches up to 7/8" dia. in 14 ga. steel.

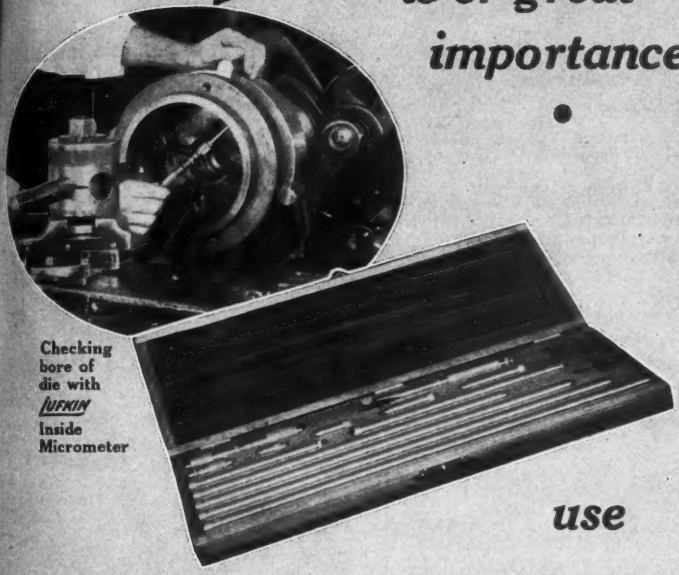
Write for detailed booklet.

The Strippit Corporation
1559 Niagara St., Buffalo, N. Y.

LUFKIN

TAPES - RULES - PRECISION TOOLS

where Accuracy is of great importance



Checking bore of die with LUFKIN Inside Micrometer

use

LUFKIN PRECISION TOOLS

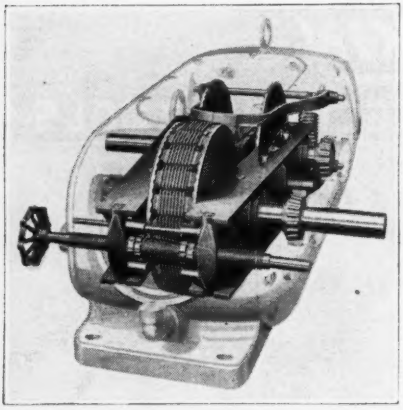
They ARE accurate, well designed and finished, and have many improved and exclusive features which are great aids to mechanics. *Catalog showing complete line sent on request.*

Specify LUFKIN for Your Shop Equipment

NEW YORK: 106-110 Lafayette St.

THE LUFKIN RULE CO.
SAGINAW, MICHIGAN, U. S. A.

Canadian Factory WINDSOR, ONT.



Link-Belt Motorized Variable Speed Transmission

motorized construction is said to make a very compact drive, eliminating the need of a separate motor base plate.

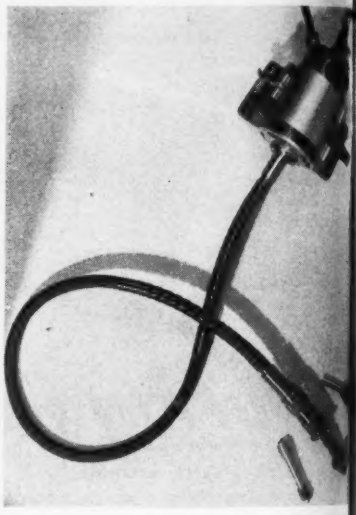
The operating principle of the basic unit remains the same as when introduced to American industry six years ago, at which time the unit was scribed as an innovation in vari speed transmission, since it was the all-metal, automatically lubricated vice which employed a specially desig side-contact chain operating betw adjustable-diameter wheels with re ally-cut teeth, for transmitting power positively from input to outp shaft.

Book No. 1574 has been prepared cover the new combinations and cap city range of P.I.V. Gears available, a will be sent to any interested rea upon request.

Jarvis "Speedwitch"

The Charles L. Jarvis Company, Gil sleeve, Conn., has brought out a hi speed flexible shaft unit which, beca of the high speed at which it opera is labeled the "Speedwitch." The Spee witch is equipped with a 1/3 h.p. bearing electric motor which runs 18,000 r.p.m.

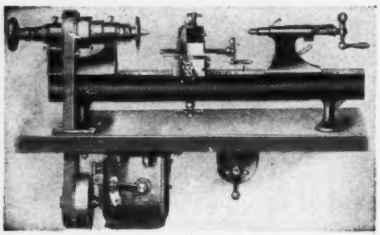
The motor is mounted in a combi



Jarvis "Speedwitch"

tion bench and overhead suspended b The flexible shaft is especially desig for this unit and is a Jarvis prod The hand piece is ball bearing equip with special precision bearings desig for thrust as well as radial load, to used with ¼-in. collets.

"Stark" NEW No. 5



NOTHING LIKE IT!

- **The largest Precision Bench Lathe.** Swings 12". Collet Capacity 1 ¼". Weighs 385 lbs.
- **Husky, Powerful, but extremely accurate.** It saves time on Die & Tool Work, Chucking, Boring, Grinding. Stark Motor Drive Unit, or Countershaft. Takes Automatic Turret Head, fast Lever Chuck Closer and fast feeds for manufacturing.
- **5 Smaller Precision Bench Lathes** with complete precision equipment.

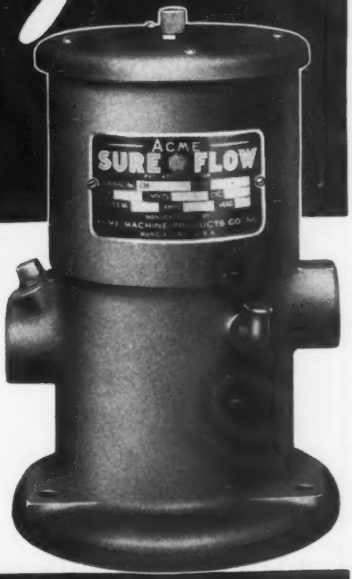
STARK TOOL CO. Established 1862 Waltham, Mass.

Originators of the American Bench Lathe.

ACME SURE FLOW PUMPS

Centrifugal

SELF PRIMING WITHOUT Submerging



A REPLACEMENT PUMP that insures trouble free service, always primed, not affected by steel chips or abrasives.

EASY TO INSTALL on any machine tool. Only one line of pipe run to the liquid to be pumped.

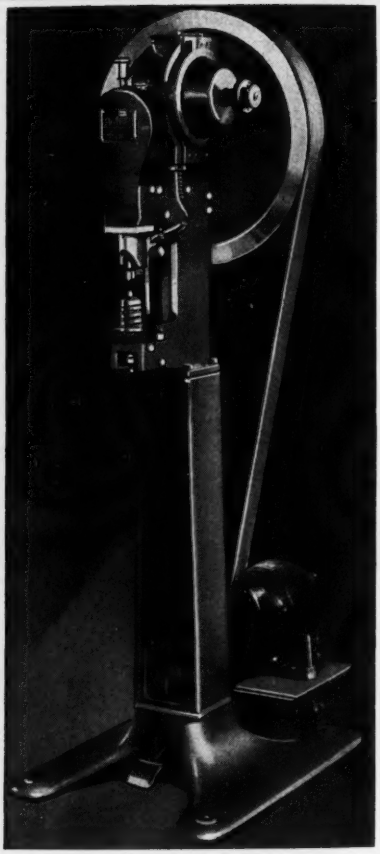
MANUFACTURED in both direct motor and belt driven models with capacities of 4, 8, 12, 20, 35, 50, 75 and 100 gallons per minute.

Representatives in all important cities.

ANY PUMP WILL PUSH
this one will also pull

Acme Machine Products Co., Inc.

MUNCIE, INDIANA



THE RIVITOR

● Feeds and sets SOLID rivets automatically. The work is placed over the locator in the anvil. The rivet is fed automatically into the jaws which are carried down by the ram. The head is formed underneath the work. May we send you literature describing further these machines?

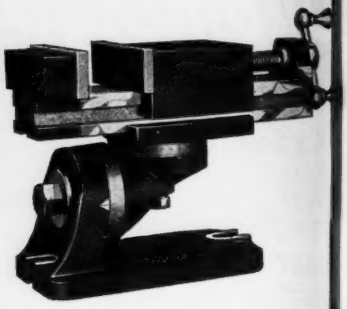
Tomkins-Johnson Co.

620 N. Mechanic Street, Jackson, Mich.
European Office: GASTON E. MARBAIX Ltd., Vincent House, Vincent Square, London S. W. 1, England

The Speedwitch is being marketed an industrial unit especially for h speed grinding, sanding and polish with profile shaped grinding wheels to and including 2 in. These wheels suitable for mold, metal pattern and work, and also for cleaning welded joi Due to its extreme flexibility the u can easily be used in places that difficult of access. The motor is co plete with built-in switch and st service cord. The flexible shaft is ⅛ in. long with rubber reinforced cas and with two protection springs fi nished on each end of the casing.

Covel No. 97-1600 Horizontal Universal Vise

A universal vise for machine use, lustrated herewith, has been placed the market by Covel Manufactur Company, Benton Harbor, Mich. T vise is so designed and constructed t



Covel No. 97-1600 Horizontal Universal

predetermined angles and clearance both directions can be produced ac rately without difficulty. The top of the vise is fastened to a univ bracket with a T-slot bolt, makin possible to move the top part, tur around, or remove it entirely in a short space of time.

All surfaces are accurately ground carefully graduated in degrees so a piece may easily be set up and lo in any position desired. The angle justments are locked by the use of h ened nuts. The vise is intended for on a surface grinder, milling mac drill press or shaper, for the takin normal cuts without moving the or changing the adjustments. The has capacity of 5 in. without jaw 4 in. with hardened steel jaws in p

TWO NEW WHEELS

to set new standards in your tool room

THE new Aloxite Brand "270" Bond Wheel, the blue wheel, is for production work to grind duplicate parts. It is balanced to grain-bond structure. It gives greater use of penetration, requires less grinding pressure, increases production. A cooler, cleaner cutting wheel that requires less dressing.

The "AA" Wheel has maximum flexibility—a major requirement of a tool room wheel. It can meet many and varied grinding conditions, take light or heavy cuts with the same efficiency, handle a wide range of steels and cover wider areas of contacts.

It is a clean cutting, long lived, economical wheel for production work where flexibility of wheel application is not so essential.

ALOXITE BRAND
REG. U. S. PAT. OFF.
"AA" AND "270" BOND WHEELS

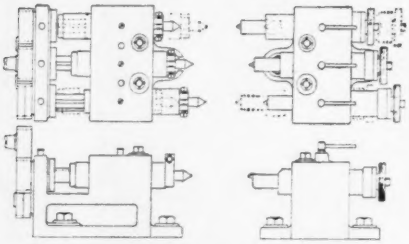
Products of **THE CARBORUNDUM COMPANY** *Niagara Falls, N. Y.*

Offices and Warehouses in New York, Chicago, Boston, Philadelphia, Cleveland, Detroit, Cincinnati, Pittsburgh, Grand Rapids. (Carborundum and Aloxite are registered trade-marks of The Carborundum Company.)

The jaws are 4½ in. wide x 1½ in. high. The base dimension is 4½x8¼ in. Weight, 36 pounds.

Two-Inch, Three-Spindle Adjustable Angle Spiral Index Centers

John B. Stevens, Inc., 304 Hudson St., New York, N. Y., has brought out the Two-Inch Three-Spindle Adjustable-Angle Spiral Index Centers illustrated herewith. These adjustable angle centers were designed for use on a universal miller in connection with the regular



Two-Inch, Three-Spindle Adjustable-Angle Spiral Index Centers

dividing head and spiral setting parts of the machine for the multiple milling of straight or spiral flutes, slots, ratchets, gears, and so on within the capacity of the machine. In reality, according to the manufacturer's statement, this attachment is a multiple spindle extension to a dividing head and—whether used at the right or left hand end of a table drive—places the universal miller in the class of production machines. All three spindles rotate in one or the same direction, and are connected and driven by gears having take-up for wear and maintenance of proper mesh.

As will be noted in the drawing, the spindles are driven by a gear located a taper shank arbor, the arbor be placed in the machine dividing he spindle while in the horizontal positi and meshing with the gear on the ce ter spindle of the centers. The arb drive gear thus referred to is suppli as a part of the equipment. The arb is generally supplied by the custom but can be supplied with the centers required.

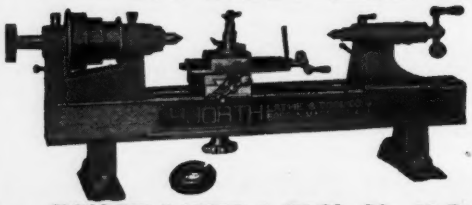
The spindles in these centers nece sarily revolve at the same speed as t machine dividing head spindle, ther fore the arbor drive gear is of a diam eter equal to that used on the spindl of the centers. The centers are pr vided for a drive gear height over t machine table to correspond to the use dividing head height over the machi table when, in horizontal position, th dimension is not less than 5 in. greater than 5¼ in. If the dimensi is greater than 5¼ in., riser pads blocks can be used.

The rated swing of the spindles is in. and the distance between spindles 2⅛ in. The height of the centers 3⅜ in. and the total length, w spindles touching, is 17 in. The wid of the feed on the machine table is in., and the total width is 6¼ in. maximum angle of 17½ deg. is obta able either right or left hand. The weight is 80 lbs. Equipment inclu one driving gear having a ⅜-in. f ⅞-in. bore and splined for ⅛-in. k three wrenches; ¼-in., ⅜-in. and ⅝- and four hold-down bolts with finish nuts and washers.

Acme Sure Flow Pump

A four gallon per minute pump d signed for both high and low pressu service has been placed on the mark by Acme Machine Products Compan Inc., Muncie, Ind. The low pressu pump is equipped with ⅛-h. p. mo

. . . for more than 1001 odd jobs



The Hjorth Bench Lathe has the speed, accuracy, handling ease, and dependability that appeal to every operator. That's why you'll find the better shops equipping with the Hjorth Lathe.

Write today for data and prices.

HJORTH LATHE & TOOL CO., 12 Beacon St., Woburn, Mass.

This month 35 new advertisers direct their selling messages to readers of MODERN MACHINE SHOP . . . the largest number of new advertisers ever to appear in a regular issue.

This magazine continues to show remarkable gains in advertising volume. More and more manufacturers of equipment and supplies for the metal-working industries are choosing MODERN MACHINE SHOP to carry their advertising messages to potential buyers.

With its carefully selected circulation, MODERN MACHINE SHOP reaches more than double the number of plants than are reached by any other metal-working magazine.

Your inquiry for advertising rates is invited.

MODERN MACHINE SHOP

704 RACE ST., CINCINNATI, O.

and the high pressure pump with a 1/3-h. p. motor. An adapter base for side wall mounting is available.

The Acme Four Gallon Pump is adapt-

Acme Sure Flow Four Gallon Per Minute Pump

able for use where a limited amount of coolant is desired, such as in connection with lathes or other single spindle machine tools. This new model comple the range of 4, 8, 12, 20, 35, 50, 75 a 100 gallon per minute pumps made this company.

Ingersoll Adjustable Zee Lock Hollow Mill

The Ingersoll Zee Lock Cutter Blade a development which has been appli to a wide variety of multi-blade cutti tools—has now been applied to inserte blade adjustable hollow mills. The mi which is a product of The Ingers Milling Machine Company, Rockfo Ill., makes available an adjustable serted blade cutter in which the inserte blades are held rigidly but which m still be adjusted to size. When co pletely worn, the blades may be renew at a fraction of the initial cost of t complete cutter.

In the construction of the tool t blade is positively locked while at t same time is adjustable in two dir tions. The blades, of which there four, are fitted into a forged and h treated alloy steel housing. The ser tions by which the cutter blade is cated are broached in the body so t by reinserting each blade in the succe ing position, the blades will be mo

New Driver 7" Motor Grinder

Price $37.50
110 volt—60 cycle A. C.

Driver Bench Grinders are built for dependable service — and are priced to meet today's restricted budgets. There should be many places in your plant where one of these grinders will help cut production costs.

Grinder is powered by a ½ H.P. condenser type motor, operating at 3450 R.P.M. Handle kinds of heavy work, in constant use. efficiency is very high resulting in low consumption. Equipped with large SKF Bearings. Guards provide full protection. shatterable glass shields and cooling cup regular equipment.

1/3 and ½ H.P. motor grinder available for 3-phase at no additional cost.

Walker-Turner Co., Inc. **Plainfield, N.**

for Modernization

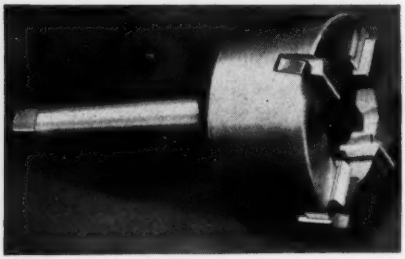
ACCURATE . . . DEPENDABLE TOOLS

. . . essential in meeting the greater demands today for speed and accuracy in measuring and gaging.

Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

BROWN & SHARPE TOOLS

forward and inward a few thousandths of an inch. After resetting, the cutter is resized by grinding. Accurate diameters are thus maintained with a rigid tooth lock and a minimum of grinding. The feature of this type of adjustment



Ingersoll Adustable Zee Lock Hollow Mill

is the rigidity—an essential which too often is lacking.

The tool housing is accurately ground to a specified body diameter, providing for supporting or piloting the tool in a jig bushing or steady rest. The cutter shown in the illustration is intended for use in lathes, drills or boring machines.

GRANT RIVETERS

● **Pioneers in the riveting field. Head rivets from smallest to ⅝" diameter, either by noiseless spinning or vibrating hammer method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.**

Write for literature—and don't forget to send samples.

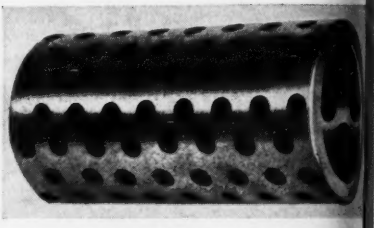
THE GRANT MFG. & MACHINE CO.
96 Silliman Avenue Bridgeport, Conn.

Similar types are available with separate piloting arbors or in shell types for use on separate arbors. The Ingersoll Zee Lock Cutter Blade used with this mill is available in either plain or super high speed steel, "J" Metal, Stellite or Cemented Carbide.

Metaline Oilless Bearings

A self-lubricating bearing, known as the Metaline Oilless Bearing, has been placed on the market by Spadone Machine Company, 122 East 25th St., New York, N. Y. The bearing is made of cast bronze, drilled as shown in the illustration. Into the drilled holes is forced a compounded lubricant known as Metaline, which is molded under tremendous pressure in cylindrical plug form and inserted into the drilled holes in the bearing. After installation, the bearings are self-lubricating and no oil or grease should be used during the life of the bearing.

The Metaline will not soften and run on the shaft, consequently there is no possibility of oil dripping or splashing



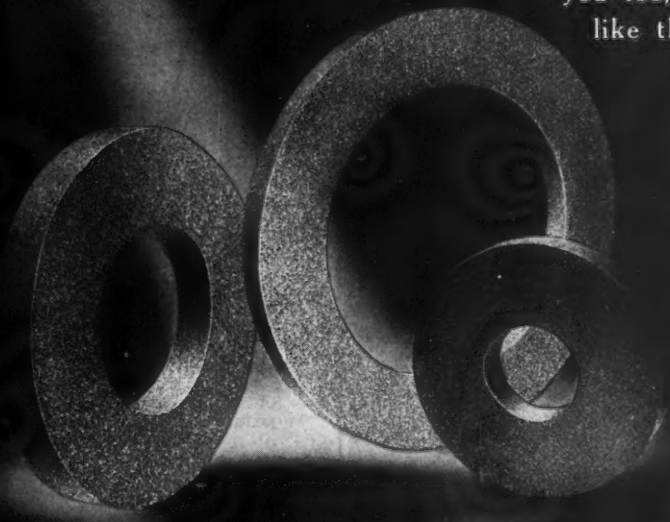
Metaline Oilless Bearings

onto the floors or products. The manufacturer states that in operations which depend upon heat, such as annealing, enameling, or baking, the Metaline Oilless Bearing will render perfect lubrication and resist heat far above the point where oil ordinarily carbonizes. The bearing is said to be particularly adapted for under water installation as it will operate in either hot or cold water. It is said that Metaline will not soften or flake, consequently clean and constant lubrication is always supplied.

The Metaline Oilless Bearing is made in all types and for all requirements. The split bearing is the most popular for heavy duty service and can be supplied without flange or with flange on either one or both ends. The one-piece sleeve bearing is also supplied with or without flanges. Thrust collar washers can be supplied in any diameter

STERLING HIGH SPEED GRINDING

Bakelite bonded Sterlith and Sterbon wheels for high speed snagging--wheels are structured to give maximum tonnage and maximum life at minimum cost. On large or small castings, floor stand or swing frame grinder these STERLING wheels have proved their efficiency in many plants--you too, will like them.



THE STERLING GRINDING WHEEL COMPANY

Abrasive Division of The Cleveland Quarries Company

Factory and Office:
TIFFIN, OHIO

CHICAGO: 133 N. Wacker Drive
DETROIT: 101-107 W. Warren Ave.

CLEVELAND TRADE STERLING MARK

STERLING ABRASIVES

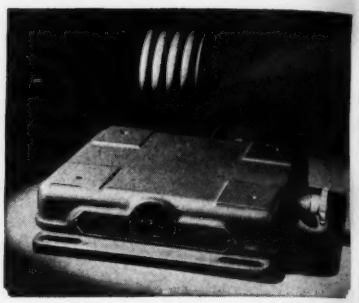
thickness with lubrication provided on one or both sides. The bearings are ordinarily supplied in sizes that range from ⅜-in. inside diameter to 5-in. inside diameter. Sizes up to 18-in. inside diameter can be supplied upon request.

Allis-Chalmers "Straitline" Automatic Motor Base

In offering the Motion Control Vari-Pitch Texrope Sheave recently announced, The Allis-Chambers Mfg. Co., Milwaukee, Wis., has not overlooked an important factor in its use and that is the Straitline Automatic Ball Bearing Motor Base illustrated here. It provides a convenient place from which to operate the Vari-Pitch Sheave and maintains a uniform belt tension thruout the speed range adjustment. It eliminates guess work as its dial indicator shows the tension of the V-Belts.

"Placing the motor on wheels" is literally what the new Straitline Automatic Ball Bearing Motor Base accomplishes when used in conjunction with a Motion Control Vari-Pitch Drive. Four Ball Bearings, totally enclosed and lubricated for the life of the unit, support the motor and the upper half of the Straitline Motor Base assuring ease of operation with little or no sliding friction. The travel of the base is in a straight line and is always securely anchored to its foundation.

The dial indicator on the Straitline Automatic Ball Bearing Base enables the operator to maintain the correct belt tension at all times thus assuring maximum belt life. The handwheel on the base controls the speed of the Vari-Pitch Sheave and simultaneously moves the Motor a sufficient amount to compensate for the change in centers between shafts resulting from the variation in the diameter of the Vari-Pitch Sheave.



Allis-Chalmers Straitline Automatic Motor Base

● 11¼ in. Swing... Two bed lengths ...24 and 36 in. center distances... 1 1/16 in. Spindle Hole.

Semi-quick change gear box with gears for cutting 4 to 80 threads per inch.

Ask for Bulletin No. 23.

Sheldon Machine Co.

3253 Cottage Grove Ave.

CHICAGO, ILLINOIS

Reed Knurl Pins

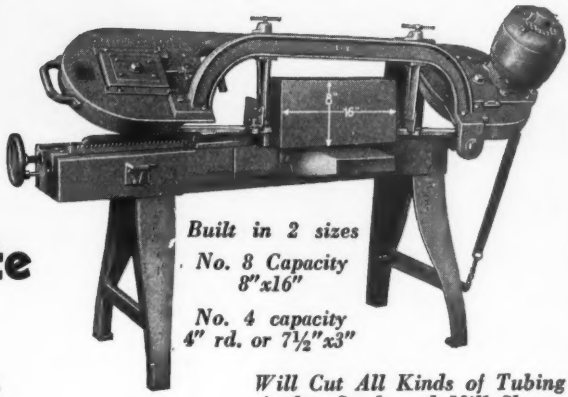
In order to make it possible for users of knurls to obtain the very best possible results on their knurling operations, Reed Small Tool Works, 239 Chandler St., Worcester, Mass., has brought out a Knurl Pin upon which the knurl can be mounted. The pins are made to close limits and are lapped to size. The pins can be furnished either plain or shouldered, and in two lengths and diameters; plain knurl pins, ⅛x⅜ and ⅛x¼ in. and shoulder knurl pins, ⅛x⅜ and ⅛x¼ in. The pins are made of tool steel, hardened, ground and lapped.

Reed Knurl Pins

Cuts Metal and Costs

DEALERS WANTED!

• Simple • Accurate • Durable



Built in 2 sizes
No. 8 Capacity 8"x16"
No. 4 capacity 4" rd. or 7½"x3"

Will Cut All Kinds of Tubing Angles, Steels and Mill Shapes

From 30 to 50% in cutting time and labor costs can be saved with this fast working saw that operates at high speed without coolant. Rigid saw guides insure accuracy and no time is lost in re-aligning or re-cutting material. Hundreds of duplicate pieces can be cut without showing a variation of .005" in thickness. Simple in design and constructed of the finest materials, long life is assured despite hard usage. Write today for the illustrated booklet giving details and low price. Wells Manufacturing Corp., 315 Seventh Ave., Three Rivers, Mich.

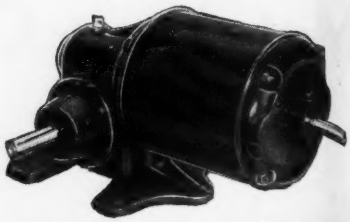
Representative in England: Gaston E. Marbaix, Ltd., Vincent House, Vincent House Square, London

WELLS METAL CUTTING BAND SAW

Wagner Gear-Motors

To meet requirements for power delivered at any desired speed, Wagner Electric Corporation, 6440 Plymouth Ave., St. Louis, Missouri, has developed fractional-horsepower gear-motors that are suitable for direct connection to stokers, agitators, conveyors, low-speed pumps, mixers, or any application requiring special speeds. They are inexpensive, highly efficient and compact.

Wagner gear-motors are available in single - reduction and double - reduction types, with right-angle shaft drive; and in single - reduction, double - reduction and triple - reduction types with parallel shaft drive. These gear-motors are available for delivering power at speeds as low as 6-r.p.m. The illustration below shows a typical single - reduction right-angle-drive gear-motor having an output speed of 30-r.p.m., driven by a Wagner 1/6-h. p., 110/220-volt, 60-cycle, 1725-r.p.m., ball-bearing single-phase, repulsion - start - induction motor with special high-speed shaft extension. The gear case incorporates a phosphor-bronze worm-gear driven by a heat-treated nickel alloy steel worm. The low-speed output shaft is supported on two roller bearings.



Wagner Fractional Horsepower Right Angle Drive Gear-Motor

A New Keyseater

With Tilting Table For Either Straight Or Tapered Bores

Send For Circular

Davis Keyseater Co.

Exchange and Glasgow Sts.
Rochester, N. Y.

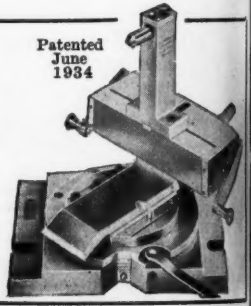
Stupakoff Comparator Microscope

A new comparator microscope for use by tool makers for accurately measuring extremely small points on tools, dies and finished products and for use in inspection departments for checking purchased articles against required specifications is being manufactured by Stupakoff Laboratories, Pittsburgh, Pa. This instrument is constructed with unusual ruggedness without sacrificing its accuracy. The instrument consists of a 60-power

From COAST TO COAST...

The Vinco Angle Tangent to Radius Dresser, for External, Internal and Surface Grinding Machines, has eliminated waste, worry and inaccuracy in dressing angles and radii tangent to each other on Abrasive Wheels. The Vinco Dresser is a universal dresser. It will dress straight surfaces, radii convex and concave, angles in degrees, minutes and seconds. Angles and radii are always accurate and tangent. This Dresser fulfills perfectly the design of its inventor, and dresses angles and radii tangent to each other for less than 25% of the cost of any other method. It is precision made of the finest materials and fully guaranteed.

Patented June 1934



Send for Descriptive Circular.

VINCO TOOL CO.

7354 CENTRAL AVE. DETROIT, MICHIGAN

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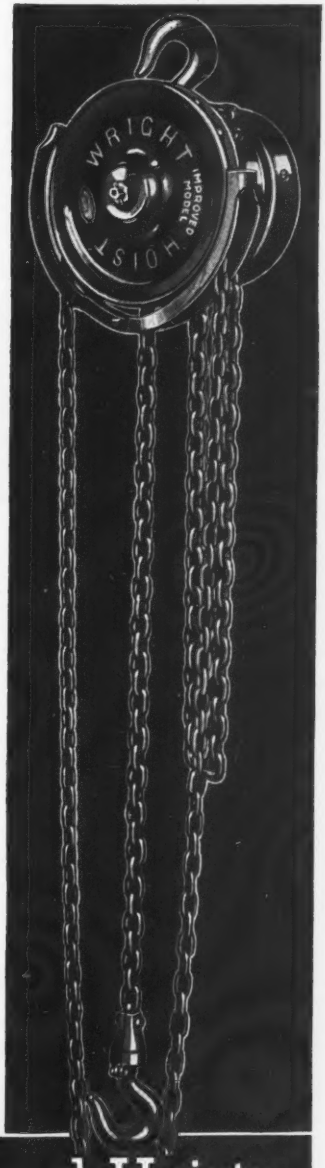
WRIGHT

up-to-date and

RIGHT



☆ The right hoist for you is the Wright. It's up-to-date and right—right in design, in quality and character of materials employed and right in performance.

No other hoist you can buy offers so much for the money you invest. Just consider what you get: zinc coated, weatherproof finish; precision ball bearings in the load wheel; safety load chain guard; ball bearings in the driving spindle bearing—and seventeen other outstanding features!

Tell your jobber's salesman about your hoist problems. When he explains the details of the Wright you too, will say, "This hoist is right!"

WRIGHT MANUFACTURING DIVISION OF THE AMERICAN CHAIN CO., Inc.

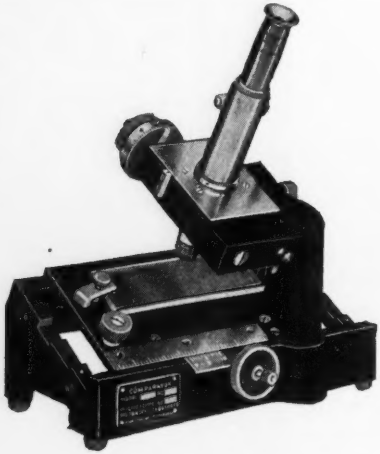
York, Pennsylvania

In Business For Your Safety

ACCO

WRIGHT *Improved* High Speed Hoists

microscope with an adjustable eye lense for focusing sharply on the cross lines on the microscope field and a movable carriage on which the objects are fastened. The carriage has a movement of 5 in. in one direction and 1 in. in the other direction. Proper means of illumination are incorporated in the design so that measurements can be made on opaque objects.



Stupakoff Comparator Microscope

Measurements in one direction are read directly on a 2-in. diameter micrometer dial in thousandths of inches, and in the other direction from a vernier scale in units of hundredths of inches. The frame assembly and carriages are constructed of aluminum alloy for lightness in weight. All other moving parts are of non-corrosive metals.

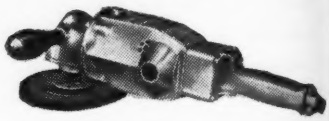
For complete description and applications of this instrument to particular industries, write Stupakoff Laboratories, 6625 Hamilton Avenue, Pittsburgh, Pa.

Black & Decker Portable Sander

The Black & Decker Mfg. Co., Towson, Md., is bringing out a completely redesigned line of portable sanders comprising four individual units. These sanders are said to offer many improved features. Power has been increased by the use of larger, more powerful motors and the housings have been restyled, reducing both size and weight. Perfect balance has been obtained by these changes, greatly reducing the fatigue of the operator.

Construction is dust-proof, eliminating wear due to particles of grit from the sanding operation reaching the vital parts of the motor, gears and bearings. The commutator and brush compartment is air-sealed to keep out grit. Switches are dust-proof and gears and bearings are protected by grease and labyrinth seals.

Spiral bevel gears, cut to close accuracy and made of selected materials are used in all models. The exhaust holes which were formerly part of the motor



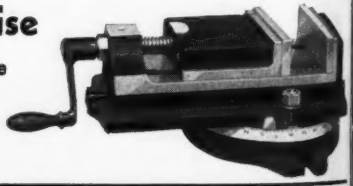
Black & Decker Portable Sander

have been replaced with slot type exhaust ports which greatly reduce the danger of clogging and overheating the motor. The 7-in. Light Duty Sander is for intermittent shop use in maintenance and similar work. The 7-in. Super-Service Sander has been designed

L-W Milling Machine Vise

$29.50 Most outstanding value on the market.

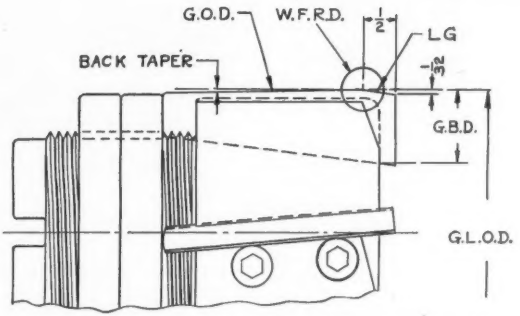
85 lb. Semi-Steel flanged construction.
6½" Jaws—Hardened and Ground.
2" Depth of Jaws. 4¼" Opening of Jaws.
1" Steel Screw and Bronze Nut.



DIVIDING HEADS MAGNETIC CHUCKS MILLING MACHINE VISES

L-W CHUCK CO. 20 N. ST. CLAIR ST. TOLEDO, OHIO

MORE ALPHABET SOUP



A typical grind is shown which meets the great majority of cases for accuracy and finish.

W.F.R.D.=where finishing reamer dulls.
G.L.O.D.=Grinding life on diameter=.250*.
L.G.=Lead grind=62 grinds.
G.O.D.=Grinds on dia.=125 grinds.

] **Based on 2" dia. reamer**

G.B.D.=Greatest blade depth. (Blade is supported best where actual cutting is done.)

This is based on grinding the lead twice, removing .015" per grind, to each grind on the O.D. removing .004".

*This varies with the size of reamer being as much as 5/8" on the 6" standard.

G & G

SERRATED BLADE CAM LOCK REAMER

GODDARD & GODDARD CO.

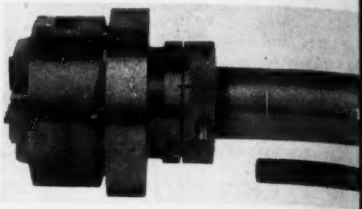
DETROIT, MICH.

for continuous use on high speed production work and the 9-in. Standard Sander is designed for intermittent use where larger working area and lower speed are required. These sanders are equipped with Black & Decker Universal Motors, to operate on 110, 220 or 250 volt current.

Eastern Machine Screw Insert Chaser Die Head

A line of insert chaser die heads has been developed by the Eastern Machine Screw Corporation, 38-58 Barclay St., New Haven, Conn., for use in cutting taper pipe threads. The die head is designed to cause the chasers to recede at a definite rate until the proper length of thread is cut, at which point the die head instantly opens, withdrawing the chasers from the work. The actual taper is governed by the positive action of the die head instead of being dependent on the chasers themselves. Thus pipe threads are produced with a taper in accordance with the prescribed specifications. Chasers cut at the chamfer only, thereby leaving no marks.

Taper action is obtained by means of a rotating opening cam placed between the back plate of the head and the knurled adjusting nut on the shank the die head. The angular position this opening cam is determined by work plunger inside of the shank of t die head which, when pushed back b



Eastern Insert Chaser Die Head

the work, rotates the opening cam at pre-determined rate.

The rotating cam is adjustable for po sition and, together with adjustment the work plunger, determines the leng of taper thread. The rate of taper fixed by the incline on the opening ca and the final opening of the die head accomplished by the sudden drop pr vided in the contour of the cam. A fi adjustment for pitch diameter is o

The Rotor E-O Drill

(capacity ¼" and 5/16" drilling in steel.)

Here's a drill you'll like.

Weighs only four pounds, but it won't stall when you put your weight behind it.

Built for production work.

Try one for 10 days at our risk.

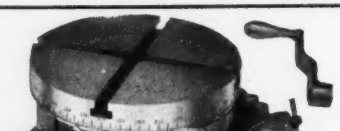
Four Models
1000 R.P.M.
1500 R.P.M.
2000 R.P.M.
3000 R.P.M.

THE ROTOR AIR TOOL CO.
5600 Carnegie Ave., Cleveland, O.
European representative
GASTON E. MARBAIX, Ltd.
Vincent House, London.

Recommended by FINEST ENGINEERING PRACTICE . .

Jacobs Chucks

THE JACOBS MANUFACTURING CO., HARTFORD, CONN.



7½ in. Rotary Table for Small Miller Tables.

STEVENS ROTARY TABLES

● Table Graduated for single degree reading and worm shaft collar for readings in single minutes.

Worm can be disengaged for turning table by hand.

Vertical lock pin provided for divisions of 2, 3, 4, 6, 8, 12 and 24. Other sizes 12" and 18" diameters.

Send for circular.

JOHN B. STEVENS INC.
306 HUDSON ST., NEW YORK, N. Y.

BAUMBACH

STANDARDIZED DIE SETS

SEMI-STEEL

DROP FORGED STEEL

Standardized Die Sets, embodying many exclusive features, and a listing of more than 95,000 stock sizes, afford a service that is unsurpassed.

Send for Our New 208 Page Catalog.

E. A. Baumbach Mfg. Co.
1806 S. Kilbourne Ave., Chicago, Ill.

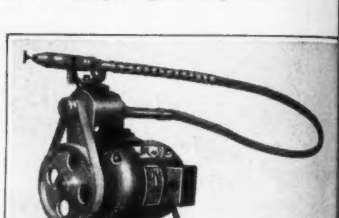
tained by the above-mentioned knur adjusting nut.

These die heads may also be equip with a chamfering and reaming tool t will chamfer and ream the ends of p nipples at the same time that the thr is being cut, thus providing a super finish to the end of the pipe.

Mall Flexible Shaft Diesinking Machine

A powerful, one-half horsepower co tinuous duty, ball bearing, countersh driven, flexible shaft machine equip with speed combinations for any pa ticular grinding or cutting applicati has been introduced by the Mall To Company, 7740 South Chicago Aven Chicago, Illinois. Extra wide speed vari tions from 850 to 14,000 r.p.m. can secured.

The tool can be fitted with rot files or shaped grinding wheels for c



Mall Flexible Shaft Diesinking Machi

ting hard or soft materials. Br bronze, bakelite, aluminum, porce glass, hardened or soft steel, and rub can be cut with equal efficiency. T tool is recommended for use in die sh pattern shops, potteries, glass factor tool rooms, foundries, and numer other industrial plants.

Goodrich "V" Belts

The B. F. Goodrich Company, Ak Ohio, is offering a complete line o belts for both multiple and single dr The Multi-V belts are available in styles. One is of single strand c struction, especially designed to w stand flexing and stretching on s pulley, short center, high speed dr For larger drives, a stronger belt of l nated construction is available w has a greater number of cords and

ral layers of stiffening fabric.

Goodrich Longlife V Belts for single drives are said to offer the following features; a sturdy cover that resists wear, fabric filler which provides transverse strength without loss of flexibility, rubber impregnated filler cords built to resist stretch and provide longitudinal strength, and a specially compounded base which acts as a cushion and shock absorbing member.

Kote-Rax Covering

Hanson-Van Winkle-Munning Co., Matawan, N. J., announce Kote-Rax, said to be a non-contaminating, corrosion-resisting coating for plating racks. Applied for dipping, Kote-Rax covers the rack with a tough, rubber-like film possessing high dielectric resistance and capable of withstanding considerable mechanical abuse. Tests made by the manufacturer indicate that Kote-Rax is not affected by immersion in the common solutions used in the following baths: chrome, nickel, cadium, zinc, copper, brass, silver, tin, and so on. Kote-Rax also withstands the action of solutions encountered in connection with the above plating operations. Racks protected by this coating have been used as long as two months without showing signs of deterioration. Old racks as well as new can be treated satisfactorily.

Kote-Rax must be heated for use in non-metalic tanks, the average application consisting of four dips at 230 deg. to 260 deg. F. It does not adhere to the metal but holds its position by shrinkage.

A complete Kote-Rax service is available for the larger plating shop. Job platers in strategic cities will be equipped to coat racks for customers who will not have a sufficient number to warrant installation of rack coating equipment.

Strand New Type 3-Speed Flexible Shaft Machine

To the extensive line of flexible shaft machines made by N. A. Strand & Company, 5001 N. Lincoln St., Chicago, Ill., has been added the New Type 3-Speed Vertical Machine shown in the illustration. The machine is made in 1/6, ¼, and 1/3 h.p. capacities, although larger types can be furnished upon demand. All of the above sizes can be furnished with various combinations of speeds, as follows: 1700, 3000 and 5200 r.p.m., or 3000, 6000, and 10,400 r.p.m.

The machine is full ball-bearing. The

MY JOB IS TO *CUT* GRINDING AND FINISHING COSTS

Almost A Hundred Uses

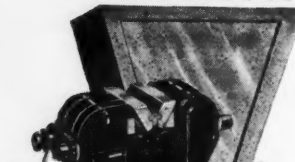
In grinding, polishing, or finishing . . . in removing surplus material and many similar operations . . . Haskins Flexible Shaft Equipment has proved its superiority. Most of the large car manufacturers, and thousands of machine shops and industrial plants the world over are saving time and cutting costs with Haskins finishing and grinding equipment. Probably you can too. R. G. Haskins Company, 4667 West Fulton Street, Chicago.

Send For Illustrated Booklet

Showing different Haskins models, illustrating scores of uses for which this equipment has been adapted. It will give you many ideas for cutting costs and speeding up production.

Haskins
FLEXIBLE SHAFT EQUIPMENT
with Greater Adaptability

The
KEYSTONE
of Industrial
Efficiency



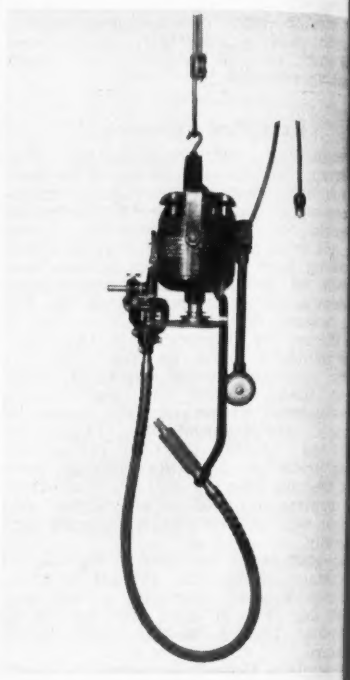
UP-TO-DATE lacing equipment is essential in maintaining today's highly competitive standards of production. Belts laced with Clipper Hooks run longer—at a lower cost per lacing (Clipper Hooks are lower in price than any hook made in America). Lacings made with Clipper high-speed lacers save both time and labor.

Ask your jobber to demonstrate the type of Clipper lacing equipment best suited to your own plant needs.

CLIPPER BELT LACER CO.
GRAND RAPIDS, MICHIGAN

Clipper
Lacing
Equipment

3-speed countershaft is located at a c
venient point for quick change-over
speeds, and the spindle holder and d
switch are also located in convenie
locations. Each machine is mounted



**Strand New Type 3-Speed Flexible Sh
Machine**

a swivel bale and provided with adj
able tie rods for suspending.

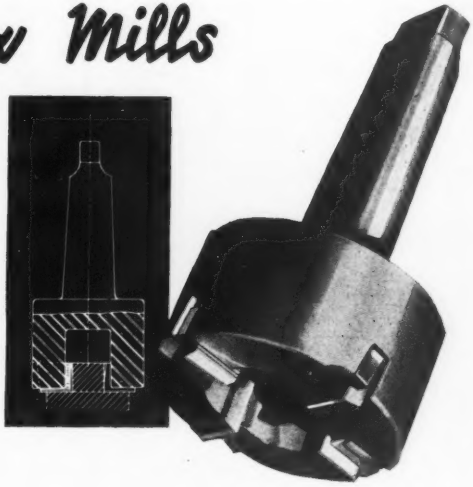
Thor No. U-26 Electric Heat G

The Independent Pneumatic Tool C
610 W. Jackson Blvd., Chicago, has
cently added to a very extensive
complete line of Universal Electric To
the new U-26 Electric Heat Gun.

This heat gun and its attachm
quickly and effectively perform m
services which in the past have b
accomplished only by time-taking,
as a rule, unsatisfactory methods.
stantaneous heat is generated to a m
mum temperature of 400 degrees.
forced through nozzle at a high velo
makes this heat gun indispensible

INGERSOLL ~~ZEE~~ LOCK

Hollow Mills



A Real Heavy Duty Adjustable and Renewable Hollow Milling Tool.

Ingersoll Zee Lock Cutter Blades are positively locked into a forged and heat treated alloy steel housing. The serrations are broached so that by reinserting the blade in the succeeding position, the blades may be moved inwardly a few thousandths and the cutter resized.

Body of Tool ground to size for piloting. Or furnished with piloting arbor or shell type for use on separate arbor.

Furnished with blades of plain or super high speed steel, J Metal Stellite or Cemented Carbide.

or Trepanning Tools

A Combination boring and hollow milling tool.

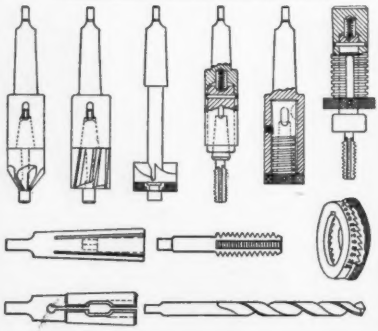
Only the narrow annular groove is reduced to chips effecting considerable saving in time and cutter cost.

Special Adjustable Serrated Blades are fitted into a forged and heat treated alloy steel housing. The blades are adjustable for wear and renewable when worn. Ground to distribute cut. Body relieved for maximum chip clearance. Made with plain body with shank as shown. Or with piloting body or with tapered hole for separate pilot or drill, or of shell type for use with separate arbor.

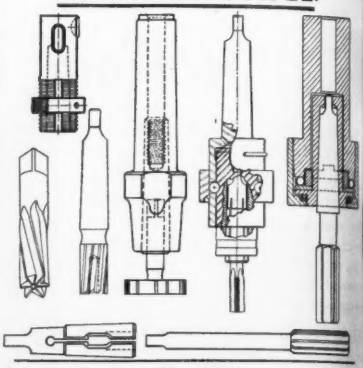
Send Ingersoll your tool engineering problems for free tool design information. You will find the Ingersoll Cutter Catalog full of data in regard to the use of all types of inserted blade cutters. Free on request.

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS, U. S. A.

SCULLY-JONES & CO.



SCULLY-JONES & CO.



(Reproduction of cross section of Catalog No. 105)

A new 8½"x11" 144 page catalog containing detailed engineering information covering a complete line of production tools for drilling, tapping, reaming and counterboring.

WRITE FOR THIS CATALOG!

SCULLY-JONES AND COMPANY

1907 South Rockwell Street **Chicago, Illinois**

SMALL INVESTMENT IN ATLAS DRILL PRESS DOUBLES PRODUCTION

The Reynolds Electric Company, prominent electrical product manufacturers of Chicago, find Atlas Drill Press equipment efficient and economical. They are tapping between eighteen hundred and two thousand 9-36 threads per hour in steel with an Atlas Model 70. The press is running full time.

DOES 5 HOUR JOB IN 2 HOURS

Its purchase represented a very large saving, the price being only a fraction of other equipment considered. On this same Atlas, Reynolds is now doing in two hours a tap job that formerly required five hours on a regular tapping outfit.

Atlas Drill Presses are standing up under this and many other similiar jobs and maintaining their accuracy. They will do the same in your plant. Made in four sizes, bench and floor models. Prices range from $14.45 to $39.45. See them at your jobbers or write direct for new 1936 catalog.

ATLAS PRESS COMPANY

246 N. Pitcher St. **Kalamazoo, Mich.**

Complete display at Atlas Sales Co., 35 E. Wacker Dr., Chicago.

HOLO-KROME FIBRO FORGED

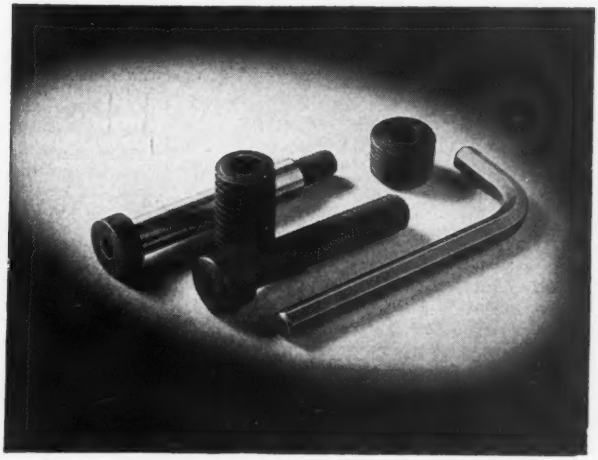
TRADE MARK

Socket Screws

Socket Walls are reenforced. True Hex. Socket. Continuous Fibres from end to end.

The Accuracy of Socket formation and unusual depth.

"File Hard" Wrench counterpart of the FIBRO FORGED Screw.



In the Spotlight of Progress

They may look similar to other screws at a casual glance but test them as you will and you will see they are decidedly different. Users marvel at the unusual strength, accuracy and Unfailing Performance of FIBRO FORGED Socket Screws, patented by Holo-Krome. Laboratory tests convincingly justify the use of these new process Screws, which have features never before found, yet always desired, in Socket Screws.

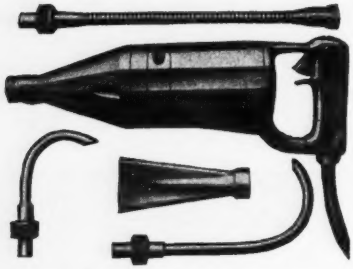
FIBRO FORGED TRADE MARK SCREWS

TEST SCREWS FREE

Enough for an adequate test to convince you. Ask any Holo-Krome Distributor or write to factory Dept. "H".

HOLO-KROME SCREW CORP., BRISTOL, CONNECTICUT

thawing purposes. Thawing out frozen grease in differentials and transmission, radiators, water pumps, spring shackles, hose connections and ice on windshields, warming up stiff crankcase oil, drying



Thor No. U-26 Electric Heat Gun

distributor heads, spark plugs and ignition systems, touching up paint jobs—these are but a few of the many applications for which the heat gun is intended. Equipped with 850W heat unit and four attachments, long and short goose neck, wide nozzle and flexible hose, permitting operation in inaccessible places. The gun is so constructed that grease, oil and dirt cannot pos affect operation.

P & H Hansen Model W-150 A Welder

An arc welder of 150 ampere capac to be known as the Model W-150, h been placed on the market by t Harnischfeger Corporation, Milwauk Wis. The outstanding feature of t welder is the unusually high electri efficiency developed by the small a cooled gasoline engine which pow it. The welder is designed to cove wide range of welding, and uses b or coated electrodes from 3/32-in. 3/16-in. for welding materials of va ing thicknesses. Welding is simplifi through single current control, accu plished by shifting the brush holders current settings over the entire ra

For field service, the standard u can be mounted on a two-wheel hi way trailer to be drawn by an auto bile or truck at the usual motor speeds. The trailer is of sturdy, welded construction with the engine generator protected from road shock automotive cantilever springs and l loon tires.

Large tool boxes are mounted on e

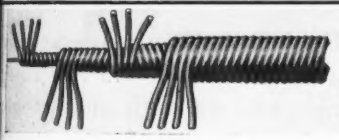
There are two general classes of S. S. WHITE FLEXIBLE SHAFTS

These two classes are designed to meet the requirements of the two general fields of flexible shaft applications, Power Drives and Remote Controls. While shafts of one class resemble those of the other, outwardly, there is considerable difference in their construction and characteristics.

For POWER DRIVES and COUPLING*

esigned to provide the maximum torque pacity for a given diameter, for operaon at comparatively high speeds and imarily for rotation in one direction ly (either clockwise or counter clockise) which is usually the case with ower drives. However, with proper lection and application they may be ed for operation in both directions.

ypical *Applications:* Flexible Shaft riven Tools, Tachometer and other strument Drives, etc.

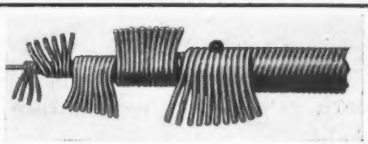


Typical construction of a Power Drive Shaft composed of a center mandrel and 4 layers of comparatively large size wire. Total wires — 17.

For REMOTE CONTROLS and COUPLING*

For Remote Controls, operation in both directions is the rule and the control and controlled units usually must be closely synchronized. Hence, S. S. WHITE Remote Control Shafts are designed to provide minimum torsional deflection, and equal deflection in either direction of rotation. In addition they have low internal friction for smooth, easy turning when curved.

Typical Applications: Airplane and Automobile Radios, Oven Thermostat Control on Domestic Ranges, Indicating Devices.



Typical construction of a Remote Control Shaft of the same diameter with center mandrel and 5 layers. Total wires — 43.

***COUPLING** is the use of shafting in the *interior* of a machine, instrument or other device.

• • •

ENGINEERING COOPERATION

Call on us freely for information on any flexible shaft question or for assistance on any specific application problem. No obligation.

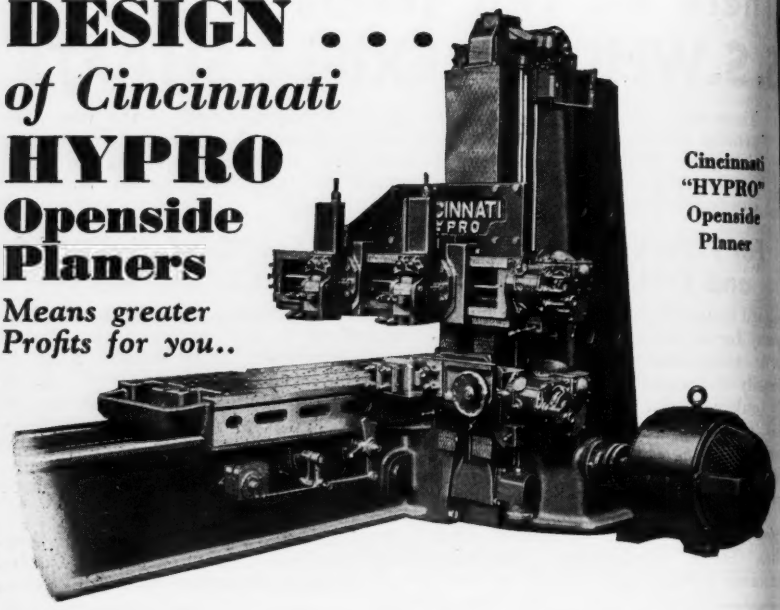
The S. S. WHITE Dental Mfg. Co., INDUSTRIAL DIVISION

10 East 40th Street, Room 2310S, New York, N. Y.

ADVANCED DESIGN . . .

of Cincinnati HYPRO Openside Planers

Means greater Profits for you..



Cincinnati "HYPRO" Openside Planer

USERS of the Cincinnati "HYPRO" Openside planers kno that these machines may be depended upon to do the rou work as well as the accurate work . . . and do both at a great profit.

That is why you'll usually find a Cincinnati "HYPRO" Openside planer wherever there is planer work to do.

But, that's not the whole story . . . there are many features of th Cincinnati "HYPRO" Openside planer that you should know about. Cutting speeds and return speeds up to 240 feet per minute

THE CINCINNATI PLANER COMPANY

CINCINNATI OHI

A QUARTER CENTURY of INTERCHANGEABILITY

DURING all the years since NORMA-HOFFMANN Ball Bearings were introduced, PRECISION has been their distinguishing feature.

"But"—we are often asked—"has this PRECISION been unvarying, over all these years?"

An actual test of the INTERCHANGEABILITY maintained in day-after-day, year-after-year NORMA-HOFFMANN production would (we believe) give a convincing answer to the question—since, in the bearing world, INTERCHANGEABILITY of parts cannot be realized unless PRECISION is maintained.

So we secured a number of stock NORMA-HOFFMANN Open Type Ball Bearings—some made almost 25 years ago, others at intervals since. These we dis-assembled and "mixed up"—interchanged inner rings, cages with balls, and outer rings—and reassembled them into complete bearings which were then subjected to our rigid PRECISION tests.

In every case, we found the reassembled unit to be a true NORMA-HOFFMANN PRECISION Ball Bearing, with internal accuracy unchanged and in every respect conforming to our exacting standards.

This is NORMA-HOFFMANN PRECISION—not new or variable or "special"—but a time-tested, inflexible standard of quality. This PRECISION is YOUR assurance of bearing speed-ability and service-ability—YOUR safeguard against bearing troubles.

WRITE FOR THE CATALOG
LET OUR ENGINEERS
WORK WITH YOU

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PRECISION BEARINGS

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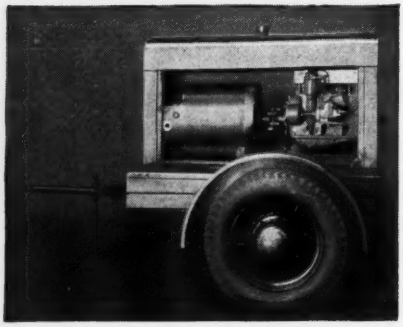
for
EVERY LOAD, SPEED AND DUTY

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN., U. S. A.



P & H—Hansen Model W—150 Arc Welder Mounted on Trailer

side of the welder for convenience in carrying equipment and accessories. The motor and generator are mounted on a single steel bed plate for minimum vibration and permanent alignment. The unit is also available on a small four-wheel industrial truck or for factory use with skid mounting.

Electric motor-equipped models, either stationary or portable, are driven through a V-belt drive, either stationary or on a two-wheel truck. Gasoline motor-equipped units are driven direct at 2200 r.p.m., mounted on a steel base. The generator is of standard P & H-Hansen design with internal stabilizing winding which provides unusually high arc efficiency without the use of external resistors, reactors, or separate stabilizers.

Allis-Chalmers "Ro-Twin" Air Compressor

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., announces a new line of two-stage sliding vane rotary air compressors for pressures up to 100 lbs. The design of the compressor is entirely unique in that both stages as well as the inter-coller are contained in a single casing. This new type of compressor is designated as the Ro-Twin.

Compared with the usual design of two-stage rotary compressor having two separate cylinders, the Ro-Twin offers the advantages of greatly reduced length and floor space, less weight, only one stuffing box and one coupling, no external air piping between stages to keep tight, and a simpler lubricating system.

The modern way of cutting sheet metal and other sheet materials.

STANLEY UNISHEARS

Pictured, No. 16 . . . capacity 16 gauge steel. Other portable models: "Mighty Midget", capacity 18 gauge steel; No. 144, capacity 14 gauge steel.

All cut up to 15 feet per minute, 3" per second. Other Stanley Unishears are available with capacities up to ¼" boiler plate. Unishears are one group of outstanding tools from the complete line of Stanley Portable Electric Tools for industry.

Send for Descriptive Circular No. S-44

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THE STANLEY WORKS
New Britain, Conn.

A complete line for Industry **STANLEY ELECTRIC TOOLS** *"Cost Less Per Year"*

THE *Turning* POINT OF PROFITABLE OPERATION

● Williams' "Agrippa" Tool Holders insure fast, chatter proof, clean cutting performance *at the turning point.* They enable you to "get out" of a lathe everything the designer built into it.

Cutter seats are accurately broached and carefully hardened. The commonest cause of cutter breakage — marred or recessed cutter seats — is eliminated by "Agrippa" design and construction.

There is an "Agrippa" Tool Holder for every regular operation of lathe, planer and shaper. Ask your distributor, or write for literature.

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Bent and Straight Tail Patterns with Single or Double Screws — both Safety and Set Screw Types.

"C" CLAMPS

Drop-forged; heat-treated. Five patterns in all popular sizes for light, general and heavy service.

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Drop-forged; heat-treated. 6 patterns.

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"AGRIPPA"
TOOL HOLDERS
"THE HOLDERS THAT HOLD"

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Headquarters for: Drop-Forged Wrenches, (Carbon and Alloy) Detachable Socket Wrenches, "C" Clamps, Lathe Dogs, Tool Holders, Eye Bolts, Hoist Hooks, Thumb Nuts and Screws, Chain Pipe Tongs and Vises, etc.,

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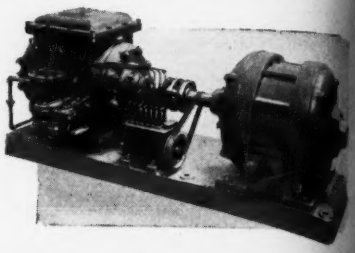
CHARLES Bond COMPANY 617-A ARCH ST. PHILADELPHIA, PA.

Having only two bearings and one flexible coupling, alignment is easily maintained. The air delivery is free from pulsations and the operation is smooth, quiet and vibrationless.

The design of the Ro-Twin Compressor is made possible through the em-

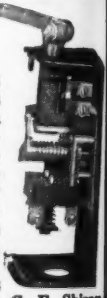


Allis-Chalmers "Ro-Twin" Air Compressor

ployment of wear-eliminating floating rings which have been a feature of Allis-Chalmers Sliding vane rotary compressors and vacuum pumps. The line of Ro-Twin Compressors includes sizes from 20 h.p., 1740 r.p.m. to 100 h.p., 600 r.p.m. for actual air deliveries from 80 cubic ft. per minute to 412 cubic ft. per minute at 100 lbs. air pressure.

G-E Shipper-Rod-Operated Master Switch

A new shipper-rod-operated master switch, which performs the function of a two-button momentary-contact push-button station, has been announced by the General Electric Co., Schenectady, N. Y. The switch possesses advantages over previous switches of this type in that its magnetic contactor will pick-up and seal-in even when the shipper-rod is operated rapidly and will drop out and remain unenergized in the case of voltage failure, even when the shipper-rod does not complete its travel. A short time delay between making and breaking the pick-up circuit is employed, so that this circuit will always be broken after it has once been established, regardless of the position in which the shipper-rod is left.



G. E. Shipper-Rod-Operated Master Switch

THERE IS A DIFFERENCE IN DRILLS!

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SKILSAW DRILLS

if you compare every feature

Here's why SKILSAW DRILLS are better!

MOTOR—Greater overload tolerance minimizes heat and lengthens life. Delivers more power under load!

SWITCH—Has longer life because of 100% overload capacity and because all the mechanism is fully enclosed in bakelite housing!

GEARS—Helical cut gears of tougher, stronger steel last longer and run quiet!

BEARINGS—Highest quality ground and lapped ball bearings are grease sealed. They are mounted in all positions to compensate for radial and thrust loads,—to minimize friction and eliminate vibration.

FRAME—Die cast aluminum frame is more compact, lighter in weight and 50% stronger!

We invite a side-by-side comparison with the drills you now use. You will find that SKILSAW DRILLS are better in *every* detail . . . that they drill more holes per hour, save more in operation, cost less to maintain! SKILSAW DRILLS are engineered to produce these results . . . *to stand the gaff* . . . yet they cost no more! The next time you buy insist on SKILSAW DRILLS and you'll never want any other kind! MADE IN 14 POWERFUL MODELS.

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CAN YOUR ASSEMBLY ENGINEER COME BACK IMMEDIATELY
TO SPEND WEEK WITH VARIOUS DEPARTMENTS=

From one of the world's largest manufacturers,— after first visit of a Parker Kalon Assembly Engineer

THIS telegram should be of special interest to concerns who feel satisfied with present assembly methods. Also those who already use Parker-Kalon Hardened Self-tapping Screws for some assemblies but employ more difficult and costly methods on other jobs.

The telegram came from such a concern . . . a great enterprise, having many competent experts in assembly work who "knew" and used Hardened Self-tapping Screws for quite a few fastenings. They had an idea they were making full use of these unique Screws that simplify fastening procedure. Actually they had overlooked many profitable uses, but that is understandable. They couldn't be expected to know as much about the application and possibilities of this modern production aid as a specialist like the Parker-Kalon Assembly Engineer who called.

By working with this specialist, the plant engineers and shop executives uncovered fastening after fastening that could be made easier, quicker, cheaper and better with Hardened Self-tapping Screws. So much was accomplished that the concern wired a special request for the Engineer to return and cover all departments he did not reach on his first visit.

Wouldn't it pay to find out whether you are missing some economies and benefits that could be gained by using Hardened Self-tapping Screws? Invite the Parker-Kalon

***Working with You, a Parker-K Assembly Engineer may* savings like these—**

AUTO CARBURETOR part attached to with cost reduction of 36.6%.

ELECTRIC RANGE assemblies requi operations made in 1 operation.

METAL DOOR frames assembled and ware attached with 25% less labo

MOLDER OF PLASTICS eliminated inserts; saved insert cost, speed molding 30%, assembly 100%.

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Assembly Engineer in your t tory to go over your fast methods and point out any op tunities that exist. That is his function. He has nothing to Your request will bring him next time he is near you.

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A Type for Every Kind of Assembly

"The Blade in the Plaid Box"
QUALITY UNIFORMITY
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TOOLS
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See What
THIS BLADE Can Do!
Bend this new LENOX HIGH SPEED BLADE nearly double—it won't snap! Twist it completely around—it won't break! The ends won't pull out. This toughness, plus its unexcelled performance and uniformity make users pridefully say, "Here's what we've been looking for—a blade that can 'take it'!"
LENOX
HIGH SPEED
HACK SAW BLADES
AMERICAN SAW & MFG. CO.
Springfield, Mass., U. S. A.
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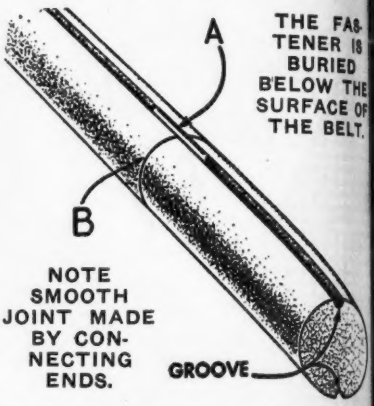
BAND SAWS

Penguin Brand Round Leather Belting with Clark Hook Groove

The drawing illustrates a method that has been perfected by Victor R. Clark Belting Company, 607 W. Washington Blvd., Chicago, Ill., for joining the ends of round leather belts without producing bumps and unevenness in the belt. The method, shown applied to "Penguin Brand" round leather belting, consists of two grooves running longitudinally on opposite sides of the belt. When the ends are joined by the usual metal fastener, the hook is buried in the groove on one side of the belt and the ends are clinched into the groove on the opposite side. Thus the entire hook is below the surface of the belt, and the joint is smooth and even. Also, the belt ends are in line.

Wherever the belt may be cut, there are the grooves, ready to receive the hook, center it, and bury it so that the joint will be even and smooth. The hazard of injury which is present where many round belts are used, is eliminated and the efficiency of the belt is increased. No special tools are necessary; the usual holes are punched for the hook and the hook is clinched in place.

Penguin Brand Round Leather Belting with the Clark Hook Groove is cut from



Drawing illustrating Clark Hook Groove in Penguin Brand Round Leather Belting

a special leather, the surface of which has been treated to increase the gripping power and internally toughened to

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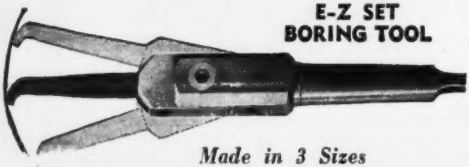
EXTERNAL or INTERNAL GRINDING on a Lathe, Shaper or Planer. Make your old Tool and Cutter Grinder a self contained unit, replace the spindle head with a Utility Grinder, also can be adapted to internal Grinding Machines.

MOTOR—Constant speed, ¼ H. P., heavy duty. Ball Bearing 3500 R. P. M. No metal contact between motor and bracket. Rubber insulation absorbs motor vibration.

GRINDING SPINDLE—Alloy steel, standard precision ball bearings, spindle adjustment automatic regardless of temperature.

Complete $65.00



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COMPACT, RIGID, Small body, large boring capacity. Adjustment actuated by a worm. Straight or taper shank. Adjustable to Jig and Fixture, Production or Maintenance work.

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Made in 3 Sizes

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Victor "Moly" Hack Saw Blades reduce metal sawing costs because they cut faster, truer and stay sharp longer.

Ask for them by name. Know them by the distinctive gold-colored finish.

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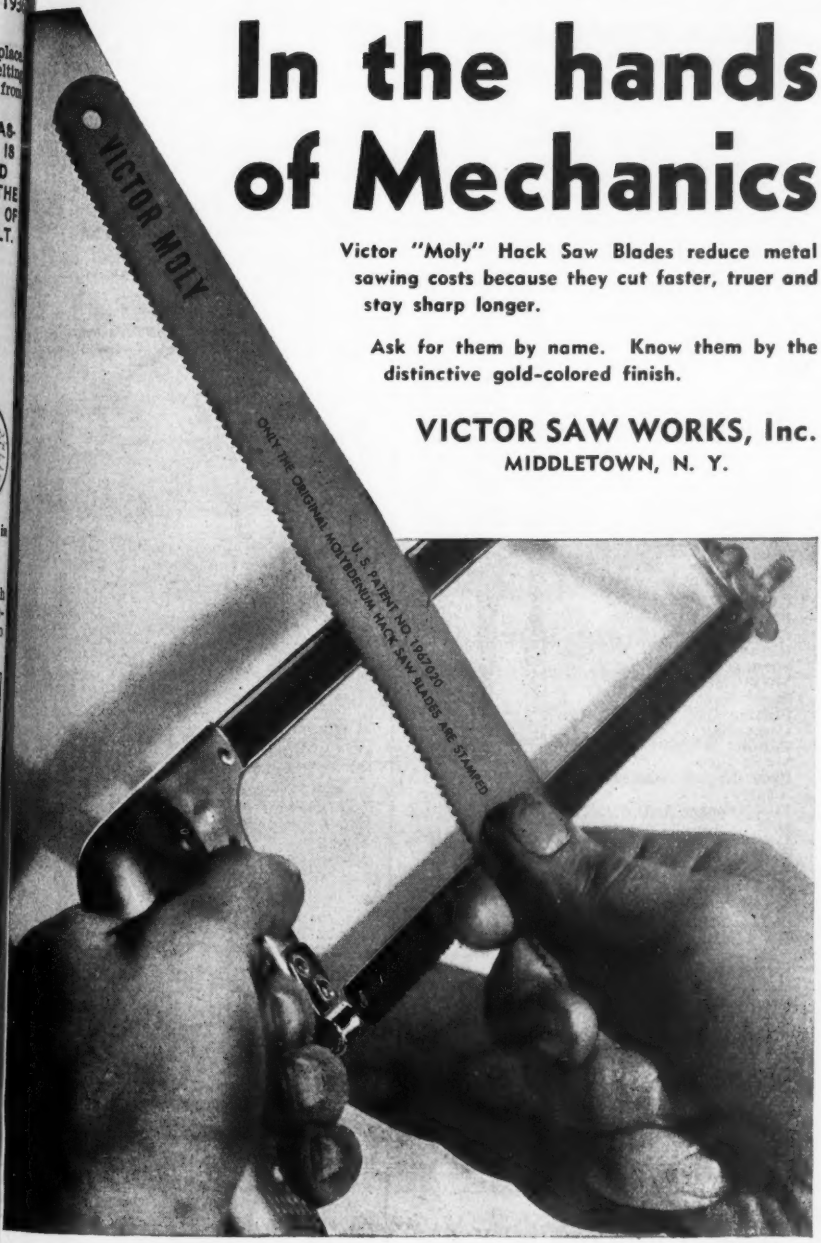

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Parallel Round
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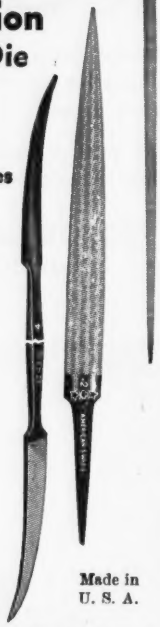

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All files cut from tang to extreme point.

Buy from nearest distributor.

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CUT PRODUCTION TIME
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SWISS PATTERN FILE IS THE ONLY TYPE FILE WE MAKE

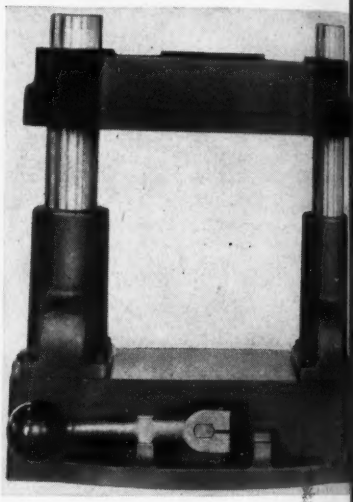
American Swiss File & Tool Co.
ELIZABETH, NEW JERSEY

Also Manufacturers of Mechanics' Hand Tools and Knurls

prevent excessive stretch. It is stro flexible, and durable. It is of gener size to absorb heavy starting and ov loads. The belt is made in ¼, 9/32, and ⅜-in. sizes, heavy gauge and ex heavy gauge. It is sold in 100-f spools.

Esco Drill Jig With New Esco Locking Mechanism

Esco Engineering Service Co., 1 Linwood Ave., Toledo, Ohio, announc the addition of six new styles, in sizes, to the line of Esco Drill Jigs ma by this firm. The feature of the ne type of jig is a newly designed arran



Esco "E" Type, Size No. 20 Drill Jig

ment for locking, in which double ecce tric gears are used, now incorporat under each guide post. This arrang ment increases work holding pressur without increasing the pressure requir to operate the jig. Overall dimensio have been considerably reduced witho a corresponding decrease in the wo area. Guide post diameters have be increased to 1¾ inches.

The new type of Esco Drill Jig especially adaptable for index tabl More compact grouping permits the u of smaller drill heads and drilling m chines than heretofore required.

Faster Cutting
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MODERN . . SCIENTIFIC . . the abrasive cloth that takes the hard work out of hand sanding. Grains stand pointed end up, evenly spaced, providing chip clearance that decreases loading and lengthens cutting life. Comes to you in Sheets or Handy Rolls.

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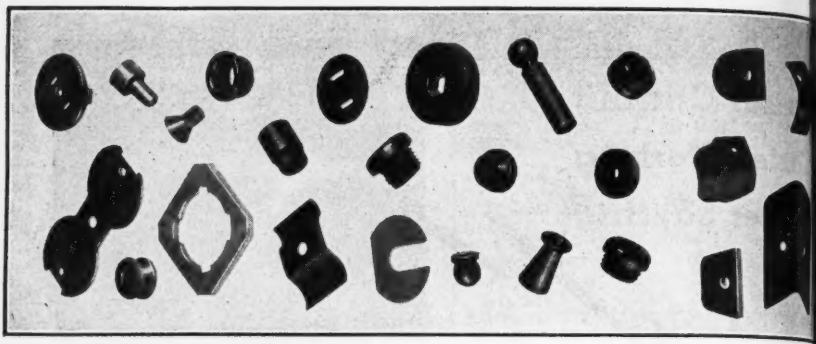
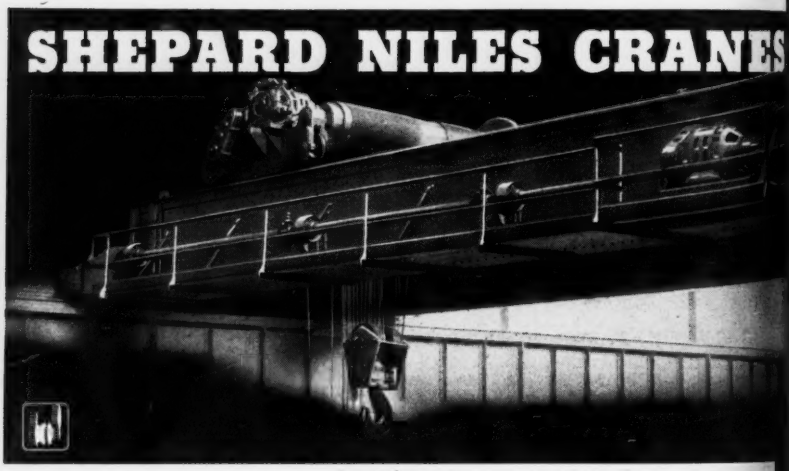


Special shapes fabricated from Wilmington Fibre

Wilmington Vulcanized Fibre

Thousands of articles in common use today are made wholly or in part of Vulcanized Fibre. Its truly amazing adaptability has given it practically universal utility where the special properties of insulation against current, sound, heat and shock, or its many other qualifications dictate its use. Fibre possesses most of the desirable qualities of other materials, together with the decided advantage of easy workability.

Genuine vulcanized fibre such as t product of the Wilmington Fibre Sp cialty Co., Wilmington, Del., is a ha dense, homogeneous material that tough, pliable and strong. Its color constant, it is noiseless in contact wi metal, and it will not chip, fracture, crack under severe conditions of servi Yet it can be easily machined into a shape desired; punched, sheared, turn cut, stamped, embossed, tapped, or ac rately threaded.



OVERHEAD TRAVELING CRANES. Capacities: 1 Ton to 450 Tons. Types: Floor or Cage Operated with single or twin hook, auxiliary hoist, extension, grab bucket, close clearance, or submerged trolley. Bulletins describing Shepard Niles Cranes and Hoists in detail will be sent to you promptly on receipt of your request.

Shepard Niles Crane & Hoist Corp., 424 Schuyler Ave., Montour Falls, N. Y.

SHEAR CUT END MILL

Manufactured by
PROGRESSIVE TOOL & CUTTER CO.
FERNDALE, MICH.

They Shear Cut the Metal

That's why they cut faster and leave that smooth finish. It's the way they are ground that brings results.
Send for a new catalog showing single, double, and other styles.

PROGRESSIVE TOOL & CUTTER CO., FERNDALE, MICH.

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ALLIGATOR
TRADE MARK REG. U.S. PAT. OFFICE
BELT CUTTER

You simply PUSH the knife through the belt. Makes a clean, square cut of any belt (except metal stitched) up to 8 in. wide. Combined guard and hold-down clamp holds belt immovable. Knife will make several thousand cuts and is readily replaceable. Used as illustrated or horizontally. Weight 4 lbs. and 3 ozs. net. Order through your distributor.

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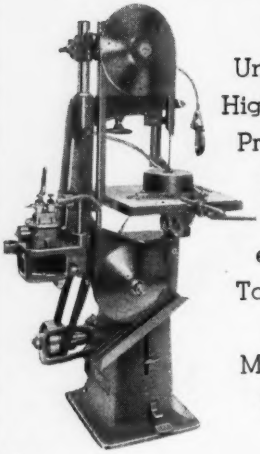


The Universal High Speed Precision Saw for every Toolroom and Machine Shop

for
Internal and External Tool and Die Work

for
Replacing many Shaping and Slotting Operations at a fraction of the time now required

for
High Production in Cutting out even H. C. Tool Steel

and with Automatic Feed, Table tiltable 15° in **all** directions, electrical brazer, for motor or belt drive.

HIGHEST PRECISION
FREE FROM VIBRATION

MARBURG BROS., INC.
90 WEST ST., NEW YORK, N. Y.

In the electrical field, wherever electric current is generated, distributed or use today, from the great power house t the smallest household appliance, fibr will be found playing its part in some form. Originally adopted because of it exceptional insulating qualities, recog nition of its many other properties ha extended its use far beyond this firs application.

The automotive industry is anothe in which fibre fabrications play a very large part. The remarkable dielectric strength of this material; its high ten sile, compression and shearing strength its non-conducting, heat enduring prop erties, the fact that it is not affected by oils or grease, and finally, the fac that it can be so readily machined and fabricated into parts of any shape or size—all these are factors that have made fibre particularly desirable for so many hundreds of uses in this indus try.

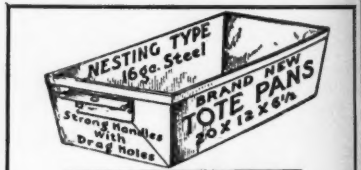
Similarly, the many special properties of fibre have brought it into use, in all industry, as the ideal material for thou sands of articles. Constantly, new appli cations are being found. And the prac tically unlimited possibilities of this material would make it seem that the list of uses will be expanded almost in definitely.

Republic Oil-Resisting Pneumatic Hose

An air hose designed especially to over come the deteriorating effects of hot oil

Republic Oil-Resisting Pneumatic Hose

from air compressors is announced by The Republic Rubber Company, Youngstown, Ohio. The tube is made from a compound similar to that used in oil



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4541 W. LAKE STREET HARDWARE DIVISION CHICAGO, ILLINOIS

No. 9 of the Series

WHAT ARE THE VARIOUS COATED ABRASIVES?

WHAT ARE THEIR USES?

IDENTIFYING COATED ABRASIVES

By E. B. GALLAHER

Editor, Clover Business Service Treasurer, Clover Mfg. Co.

IN THIS SERIES of ads we have described the various Coated Abrasives—their construction—their uses. We have stressed the importance of getting the right abrasive on the correct backing for the special work you have in hand.

• The problem now confronting us is to be able to positively identify the particular abrasive we require.

• There are only 5 shop abrasives in use—Flint, Garnet, Emery, Aluminous Oxide and Silicon Carbide.

• Flint, Garnet and Emery coated abrasives are sold by all manufacturers under their real names.

• Aluminous Oxide and Silicon Carbide coatings, however, ARE SOLD UNDER SOME 40 OR MORE DIFFERENT TRADE NAMES. This is very confusing.

• We give herein the various trade names in use, and opposite each one we give the real name of the abrasive used.

• Remember that all the various abrasive grains used by all the manufacturers are identical. The gradings are according to an accepted standard; likewise the coatings, backings, etc.

• You must know, however, whether you are getting Aluminous Oxide or Silicon Carbide —the grade name won't tell you this.

TRADE NAME	REAL NAME
Abrasite	Aluminous Oxide
Adalox	Aluminous Oxide
Adamite	Aluminous Oxide
Alabrase	Aluminous Oxide
Al-Ox	Aluminous Oxide
Alexite	Aluminous Oxide
Alundum	Aluminous Oxide
Amunite	Silicon Carbide
A-O-66	Aluminous Oxide
Armourite	Silicon Carbide
Baco	Aluminous Oxide
Blue-Back	Emery
Blue-Stripe	Silicon Carbide
Boxite	Aluminous Oxide
Carbalox	Aluminous Oxide
Carbicon	Silicon Carbide
Carbonite	Silicon Carbide
Carborundum	Silicon Carbide
Crystolon	Silicon Carbide
Crystox	Silicon Carbide
Durite	Silicon Carbide
Durundum	Aluminous Oxide
Electric-Abrasive	Aluminous Oxide
Garalun	Aluminous Oxide
Green-Stripe	Flint Quartz
Herculundum	Silicon Carbide
Jewelite	Silicon Carbide
Jewelox	Aluminous Oxide
Luminox	Aluminous Oxide
Lumnite	Aluminous Oxide
Metalite	Aluminous Oxide
Orange-Stripe	Garnet
Production	Aluminous Oxide
Red-Stripe	Emery
Sil-Carb	Silicon Carbide
Three-Mite	Aluminous Oxide
Three-M-ite	Aluminous Oxide
Tri-M-ite	Silicon Carbide
Usalox	Aluminous Oxide
Wausite	Aluminous Oxide
Yellow-Stripe	Aluminous Oxide

• To guard against any mistake in proper identification, we have adopted Color Stripes, which are printed on the back of each sheet: GREEN for Flint—ORANGE for Garnet—RED for Emery—YELLOW for Aluminous Oxide—BLUE for Silicon Carbide.

• These colors identify the KIND OF ABRASIVES used, and appear on both papers and cloths.

• And, by the way, the Color-Stripe Line made by us, is as good as the best, and better than most.

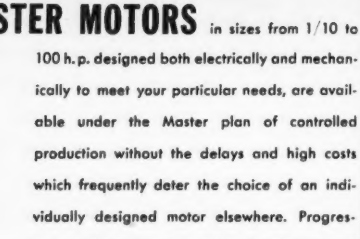
• File these ads for reference.

Gallaher

CLOVER MFG. CO., NORWALK, CONN.

Also Makers of the Famous CLOVER GRINDING AND LAPPING COMPOUNDS

MASTER MOTORS in sizes from 1/10 to 100 h. p. designed both electrically and mechanically to meet your particular needs, are available under the Master plan of controlled production without the delays and high costs which frequently deter the choice of an individually designed motor elsewhere. Progressive, realistic men who think for themselves, who know values, and who have sound ideas of their own about design, have made good use of Master Standardized Special motors to greatly improve their motor driven applications. Master engineers are eager to aid you in selecting the correct motor for your needs.



The MASTER ELECTRIC COMPANY
DAYTON OHIO USA

conducting hose and can actually saturated with oil for long period time without affecting its service

The hose is said to resist heat high degree, high pressures, abra and exposure to sun and weather. recommended for general industrial where service is exceptionally se High strength has been obtained, w out impairing flexibility, by construc the plies from a special twisted which is thoroughly impregnated a tenacious rubber compound.

Crescent Spacer Punch

To simplify the task of laying out metal work, the Crescent Machine & Tool Co., 10th Ave. and 10th St., Rockford, Ill., has brought out the spacer punch shown in the illustration. The Crescent Spacer Punch can be used for spacing in two directions; from center to center and from line to center of hole. The punch is designed to space correctly for a ¼-in. drill. The body of the punch is made solid for ¼-in. drill size and the punches are of tool steel hardened and drawn.

U. S. Royal Cord Belt

The U. S. Royal Cord Transmi Belt is announced by the Mecha Goods Division of the U. S. R Products, Inc., 1790 Broadway, York, N. Y. This belt is intende meet the whole range of transmi problems. The most outstanding acteristic of the belt is the squar edge, in which respect, as well as i coloring of mahogany with blue it resembles the U. S. Royal Duck Due to the cords being imbedde rubber, the cut edge of the U. S. Cord Belt is said to stand up under gruelling test of running against ers.

The laminated and cut edge con tion permits the use of a single p duck on each side instead of the several plies. It is said that the bodiment of cord fabric in the belt vides an advantage in strength. are no bias seams, a special duck h been developed to eliminate these and requiring but one cover joint.

NO SCALE—NO OXIDIZATION—NO PITTING

For Better Heat Treating
INTEROVAL

HEAT straight carbon steel, Hi-Carbon, Hi-Chrome, and High-Speed steels from minimum to maximum temperatures without loss in size, or danger of pitting, or oxidization.

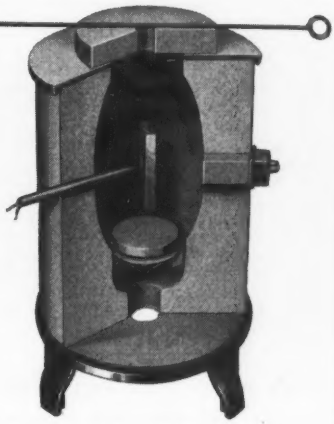
Pyrometer fire end in close proximity to work.

High speed heat in less time and at less expense regardless of fuel used.

Opening inside of furnace permits heat treating the ends of long parts or tools.

Can be converted quickly into a lead, cyanide, or salt bath furnace accommodating 6 x 12" pot.

GUARANTEE: INTEROVALS are sold on 30 days trial. Return them at our expense if they do not make good.



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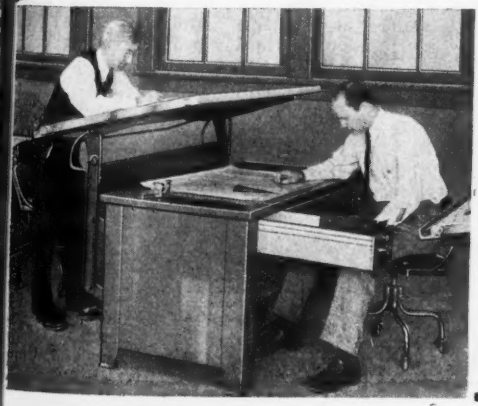
BENNETT INSURED STEEL TREATING CO.

130-132 SOUTH ST. NEWARK, N. J.

ANY ADJUSTMENT INSTANTLY

The Hamilton Auto-Shift Drawing and Reference Table is adaptable instantly to any height or slant necessary. That is why it is used by automobile and machine designers. No draftsman can know what real drafting convenience is until he has worked on the full-floating, counter-balanced, super-adjustable drawing board of the Auto-Shift Table. Send for further information.



HAMILTON
Drafting Room **FURNITURE**

HAMILTON MFG. CO.
TWO RIVERS, WISCONSIN

HAMILTON MFG. CO., Two Rivers, Wis.
Please forward New Catalog No. 10.

Name.....

Title.....

Firm Name.....

Address.....

City..... State..... M.M.2-36

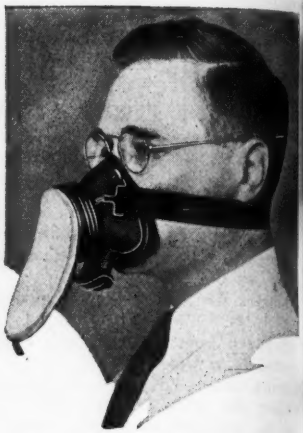
construction provides as nearly an endless belt as can be constructed. The belt is available in widths up to 24 in. and in plies from 5 up.

"Nucut" Files

A line of files, marketed under the trade name "Nucut", is now being made by Heller Brothers Company, Newark, N. J. The manufacturer claims that the files are cut on automatic machines which provide a different type of tooth than has been available heretofore. The files are annealed and hardened in electric furnaces and are said to possess uniform temper and durability. The teeth on the Nucut file are said to be so constructed as to lend themselves not only to initial sharpening, but to repeated sharpening, making the files exceptionally economical.

Willson No. 400L Bag Respirator

A new type respirator with approved high efficiency, having passed the U. S. Bureau of Mines tests for lead and Type A dusts, has recently been offered by Willson Products, Inc., Reading, Pa. It has a filter bag through which breath very close to normal is assured, a result of a very large filtering area 40 square inches. The face mask made of rubber and is adjustable to



Willson No. 400L Bag Respirator

THE CHIPS TELL THE STORY

Even a performance like this is easy for WEL-DON End Mills. Strong, double back-off flutes—less breakage. And how those hollow-ground cutting edges do make the chips fly!

Write us

Slot cut through steel 1⅜" deep, at 2" per minute with ⅝" end-mill

THE WELDON TOOL CO. 321 Frankfort Ave. Cleveland, O

-Another
NEW
BROWN & SHARPE MOTORPUMP . . the No. 204
REVERSIBLE CENTRIFUGAL

May we tell you about its many advantages?
Circular on request.

Brown & Sharpe Mfg. Co.
PROVIDENCE, R. I.

BROWN & SHARPE PUMPS

Keep The House In Order!

USE "PARENT" SHELVING UNITS

UNIT No. 22 Specifications
Closed Back and Sides Shelves adj. on 2" Centers. Closed Base. 36" Wide—13" Deep 7' 3" High Overall Olive Green Finish (baked).

$13.85

F.O.B. Phila., Pa. Shipped Setup.

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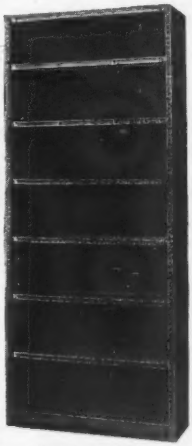
See the many different arrangements with Bin Dividers, Bin Fronts, Drawers, Boxes, Etc.



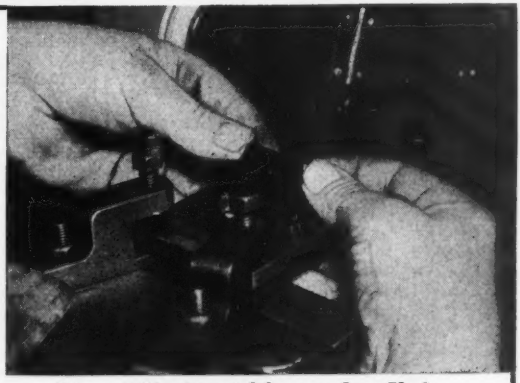
UNIT No. 22

PARENT METAL PRODUCTS INC.
1703-15 RITTENHOUSE STREET
PHILA., PENNA.

a pointer on PRECISION

THERE's one sure way to obtain the greatest degree of precision in any kind of toolroom work. That's to provide the toolmaker with Johansson Gage Blocks—the world's standard of measurement. Sets or individual blocks available at moderate prices.

Write for Catalog No. 11



Using combination of Johansson Gage Blocks to measure snap gage on a grinder

JOHANSSON
GAGE BLOCKS AND ACCESSORIES

Manufactured, sold and serviced in the United States and Canada by
FORD MOTOR COMPANY
Johansson Division Dearborn, Michigan

● It pays to protect your stock, products, parts, tools, machinery, dies, etc., from

RUST DAMAGE

with Protex Non Rust Oil—grades for every purpose—Write us for sample and service.

Wayne Chemical Products Co.

9470 Copeland Ave. ● Detroit, Mich.

THE M-B SUPER SPEED AIR GRINDER

Has an amazing speed of 100,000 R.P.M. Small-Light-Compact. Just the tool for getting into small, difficult places. Write for particulars. Good opportunity for Dealers.

MONNIER BROS., INC.
Algonac, Mich.

shape of face by bending a wire fra ing spring which constitutes a part the lower mask edge.

The filter bag is assembled on mask by means of a screw ring in of which is the intake valve assem including moisture baffle, serrations prevent air lock and a flexible in diaphragm. Air is drawn in through filter bag at the front and exhau through the valve assembly below face mask. Filter disc replacement pr lems are satisfactorily solved by the of this cleanable bag type filter wh in most cases lasts as long as the re rator itself. The complete respir weighs only 5¼ ounces.

Pease Model 7 Continuous Prin

The C. F. Pease Company, 813 Franklin St., Chicago, Ill., has brou out a continuous printing machine the production of blueprints and oth prints at low cost. The machine, to known as the "Model 7" was develop to meet a growing need for a conve ent and dependable method of reprodu ing quickly and economically tracin charts, diagrams, bulletins, and so in a variety of forms including blu prints, brownprints, or direct proce prints in any dimensions up to 42 inch in width. Also, it makes an excelle auxiliary equipment for use in conjun tion with the larger type continuo printing machines.

The Model 7 is of the horizontal ty and is attractively finished overall wi two coats of olive green crystalli baked enamel. The construction sturdy and compact and the design such that the machine can be set clos against the wall, thus conserving flo space.

In operating, the tracings and sen tized paper are fed into the machi at the front over the feed table an onto an endless fabric band which ca ries them upward, around, and throu the machine in close contact with curved section of highly polished pla glass where exposure takes place. Aft exposure, both the tracings and pap are returned to the table at the front the machine, convenient to reach. Go contact is assured at all times and uni form tension of the band is maintain and controlled by a self-adjusti spring-regulated front band roll.

To facilitate the making of prints continuous operation, two movabl hangers extend downward vertica from the feed table and a ½-in. sta rod is provided for holding a roll paper measuring as much as a full 1

COLONIAL DRILL JIG BUSHINGS

A. S. A. STANDARD

You are sure of getting accurate and dependable drill jig bushings when you order COLONIAL. Made of High Grade Tool Steel. And when you order COLONIAL, you'll get them quickly.

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Send for useful new book of engineering data . . . **FREE**

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RUTHMAN "GUSHER" PUMPS

high volume, low pressure pumping . . .

One outstanding RUTHMAN feature which combines top-notch performance with strict economy.

Simplicity of design and the elimination of all unnecessary moving parts in Gusher Pumps bring you more efficient pumping with lower power consumption and less replacement cost.

Investigate RUTHMAN GUSHER PUMPS and see why more than 80 large machine tool builders install them as original equipment. Let our engineers make recommendations on your individual problems. No obligation.

THE RUTHMAN MACHINERY CO.
536 E. Front St. Cincinnati, Ohio

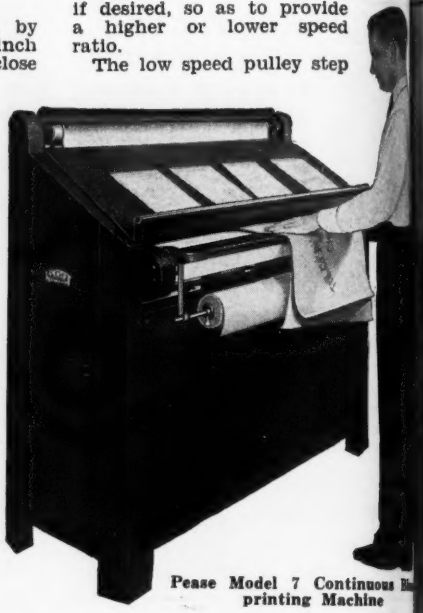
GUSHER COOLANT PUMP

yards in length.

Uniform illumination is provided by an arrangement of 3½-ampere 50-inch mercury vapor tubes mounted in close proximity to the curved section of polished plate contact glass. Each tube is independently mounted and is easily accessible by lifting and removing the panel-type door. The Model 7 machine can be equipped with either three or four mercury vapor tubes, depending upon the intensity of illumination and speed of operation required. Three tubes will provide illumination sufficient for a printing speed of two linear feet per minute, and four tubes will provide for a speed of two and one-half feet per minute, using good tracings and a fast blueprint or direct process paper.

The Model 7 machine is driven by a sturdy variable-speed motor and all speeds are controlled by means of a 28-point rheostat located at the right hand side of the machine. Power is transmitted through a reduction gear unit to the contact band drive roll by means of a steel roller chain and sprockets. A two-step motor pulley permits the belt to be shifted, if desired, so as to provide a higher or lower speed ratio.

The low speed pulley step



Pease Model 7 Continuous Bl... printing Machine

Makes a Band Saw Joint as good as the saw itself

In a few minutes this electric Brazer makes a perfect, strong band saw joint as good as the saw itself. Equally efficient on metal and wood cutting saws. Temper is under full control at all times. Simple to operate, and safe too—no shocks, no fire. Recommended by 75 band saw makers and thousands of operators. Price, only $50.00. Write for descriptive folder.

Oliver Machinery Co., Grand Rapids, Mich.

"Oliver"
ELECTRIC
BAND SAW BRAZER

GEARS
Good Gears Only
All Kinds
Any Quantity
At the Right Price
THE CINCINNATI GEAR CO.
1825 READING ROAD, CINCINNATI,

V-GAP ETCHER & DEMAGNETIZ...

ALLOY NON-STICKING POINT

Four Stations for etching depth.

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TAYLOR SALES 15505 Lin... Detroit, M...

1905 Strand 1936

FLEXIBLE SHAFTS
and
MACHINES OF HIGH QUALITY
for

Grinding — Polishing — Buffing — Reaming — Wire Brushing — Drilling — Rotary Filing — Nut Setting — Screw Driving — and many other operations.

Vertical and Horizontal types
⅛ to 2 H. P.
Many Attachments.
Send for General Catalog.

Manufactured by
N. A. STRAND & CO.
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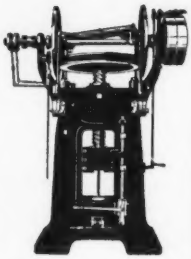
PATENT PERCUSSION
POWER PRESSES

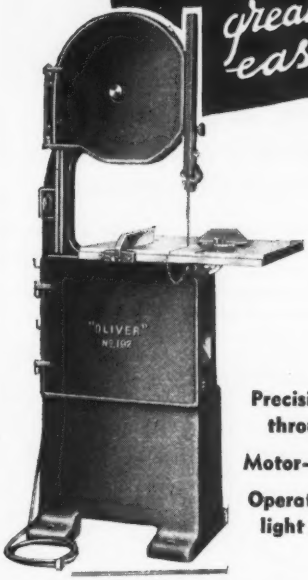
EXCELLENT for
- COINING!
- EMBOSSING!
- HOT and COLD PRESSING OF METALS!



Manufactured by
Zeh & Hahnemann Co.
184 Vanderpool St.
NEWARK, N. J.

"OLIVER" BAND SAW

Saws SHEET STEEL with greatest of ease



Precision-built throughout

Motor-on-Shaft

Operates from light socket

This "Oliver" 18-inch Band Saw has all the refinements developed for larger "Oliver" Band Saws. It's especially effective in sawing sheet steel. Also sprues of soft metal, hard rubber, compositions, wood, etc.

Rips to 11" wide. Cross-cuts and miters up to 8". Table tilts 45° to right. It's a sturdy, precision-built machine in every detail.

"OLIVER" EQUIPMENT FOR MACHINE SHOPS
Cut-Off Saws
Speed Lathes
Disk Grinders
Belt Grinders and Polishers
Die Filers

● *Write for Descriptive Folder*

OLIVER MACHINERY COMPANY
GRAND RAPIDS, MICHIGAN, U. S. A.

Now You Can Buy Diamond Dressing Tools that are Guaranteed!

Koebel Multi-Point Tools provide a number of small, whole, natural diamonds set in spaced relationship: from two to five sharp diamonds in contact with the wheel, each taking its share of the total burden. This permits faster traverse, a finer, more uniform dressing, providing a higher work finish, more parts per dressing, and longer wheel life. They will hold-size for any width of face.

No re-setting is ever necessary. The Diamonds are mounted in Koebelite (patented process) guaranteed to hold them rigidly for their entire useful life. The metal will not load or glaze, but grinds away freely as the diamonds wear.

SEND FOR THIS FREE BOOK

A brand new "easy-to-take" type of instruction book, full of right-to-the-point information about how to get more and better work from your grinding wheels. Your copy will be mailed free upon request.

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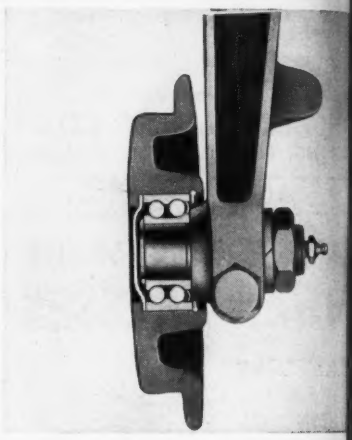
1202 Oakman Blvd., Detroit

KOEBEL
DIAMOND TOOLS

gives a belt travel of from 4 in. to 30 per minute with 22 points of control the rheostat and the high speed pul step gives a belt travel of from 12 to 60 in. per minute with 21 avail points of control on the rheostat. Se rate switches are provided for the mo and for each mercury tube. An ext sion cord and plug are standard equ ment and the machine can be connec to any electrical circuit of 20 amp capacity and not exceeding 110 v AC or DC. The four-tube machine be furnished for 220 volts DC.

Osborn Tramrail Trolley Whe

The illustration shows a trolley wh of improved design that has be brought out by the Osborn Manuf turing Company, 5401 Hamilton Av

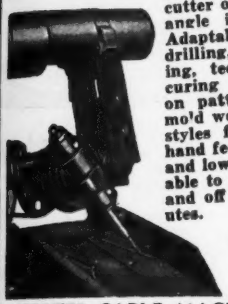


Osborn Tramrail Trolley Wheel

Cleveland, Ohio, for use in connec with Osborn Tramrail Systems. wheel is said to be of a special anal of high strength cast iron and is signed with a deep-chilled tread flange. The chills provide a hard, smo long-wearing tread surface. A sl crown on the wheel tread brings wear on the rail flange in from the side. The straight flange of the w is a factor in reducing rolling fric to a minimum.

Another important factor in the sign of the wheel is the double shielded type ball bearing which is sembled complete by the bearing ma facturer to assure extreme accuracy

ANY MILLER
+
Porter-Cable Universal Milling Machine Head
=
Universal Milling Machine

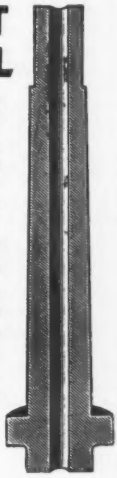


Simplifies set-ups, saves hand work on awkward jobs because cutter operates in any angle in any plane. Adaptable for boring, drilling, broad milling, tee slotting, securing proper draft on patterns, die and mold work, etc. Seven styles for power and hand feel millers, high and low speed. Adaptable to any miller, on and off in three minutes.

Fifteen days trial. Ask about it.

PORTER-CABLE MACHINE CO.
Metal Div. No. 3, Syracuse, N. Y.

THE HEART OF THE TOOL



● The spindle is the most important part of any machine tool. That's why machine tool builders are so particular about their spindles and use American Hollow Bored products. They are sure of high quality, dependable forgings and quick service. Get complete information on our spindles, shafts, rams, and hydraulic cylinders.

Write for prices.

AMERICAN HOLLOW BORING CO.
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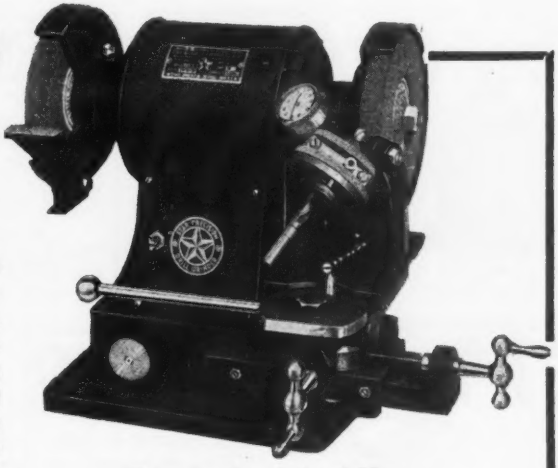
-Grinds
81 SIZES OF Drills
No. 31 to ½"

NEW!

This new Star Precision Grinder puts drill grinding on a production basis. Its simplicity and accuracy saves as high as 50% on drill costs and insures uniform accuracy that guarantees perfect holes.



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STAR MACHINE & ENGINEERING CORP.
Division of Star Electric Motor Co.
BLOOMFIELD AVE. BLOOMFIELD, NEW JERSEY

the bearing in the wheel. The completely dust protected bearing is grease lubricated and the assembly may be taken apart for inspection and cleaning. It is claimed by the manufacturer that an Osborn trolley equipped with these precision bearing wheels has an exceptionally low draw bar pull.

American Optical 6-Curve Lens

A goggle lens that is said to offer unusual resistance to impact is now being offered by the American Optical Company, Southbridge, Mass. The new lens, called the 6-Curve Super Armorplate Lens, gets its extra strength from its high curvature, according to the manufacturer. An indication of its superior impact resistance is provided in the result of tests used to determine its strength.

A one-inch solid steel ball dropped onto the lens from a height of 10 ft. is shown in the illustration at the instant of impact. The standard test for goggle lenses specifies a ⅝-in. steel ball dropped from a height of 39 in. Thus a height of three times the government standard and a weight of four times the standard was used in testing the new 6-Curve Lens—a blow having twelve

A one-inch solid steel ball was dropped on "6-Curve Lens" from a height of 10 ft. The photograph was taken at the moment of impact. (Exposure, 1/100,000 second.)

times the energy of the standard test.

Besides its advantages in resisting impact hazards, the 6-Curve Lens is declared to be unusually effective in deflecting glancing blows, due to its high curvature. The curvature also permits a closer fit to the face without inter-

Greenerd Arbor Presses

HYDRAULIC
HAND OPERATED
MOTOR DRIVEN

No. 3JR

Greenerd Arbor Presses
NASHUA, N. H.

KEYWAYS

For Straight or Taper Keys

CUT IN

Straight or Taper Bores With

YOUR ARBOR PRESS

And Our Cutters

Bulletin Free

THREADWELL
GREENFIELD, MASS.

NEW PALMGREN ANGLE VISE

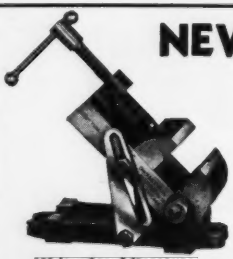
—AT ANY ANGLE—

—ACCURATELY GRADUATED—
(With Hardened and Ground Jaws.....$9.00)

HEAVY DUTY SIZES UP TO 8"

ONLY $7.50

No. 0
WIDTHS 2½"
OPENS 3"
DEPTH 1 7/16"
LENGTH 5"
WEIGHT 10 LBS.



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Chicago Tool & Engineering Co.
8400 SOUTH CHICAGO AVE., CHICAGO, ILL.

RED DEVIL PRODUCTS
PUMP PACKING

THE SEMI-PLASTIC METALLIC PACKING

A UNIVERSAL PACKING
Wrapped in Babbitt Foil

Used on all kinds of pumps and wherever a good Packing of its type can be used. It is popular in laundries, creameries, breweries, ship yards, refineries, in automobiles, on elevators, etc.

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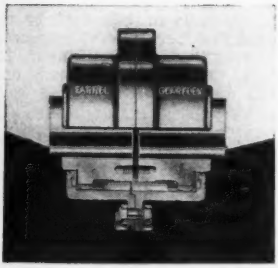

In the Farrel Gearflex Coupling the load-carrying surfaces are the teeth of the external and internal gears protected by an oil film which provides a cushioning effect, giving silent operation, trouble-free service and long life.

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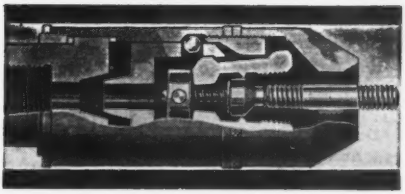

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The New Way

The Titan Stud Setter is a new self-opening type for driving stud bolts . . . it is full automatic in loading and releasing. It is a power driven unit adaptable to all types of drill presses and air or electric tools. Positive in driving and automatic in releasing, the studs may be set to any predetermined height desired and without straining or mutilating the threads.

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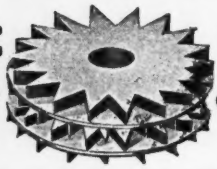
We make all types of Dressers and Cutters



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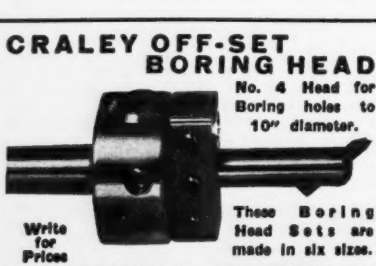
No. 4 Head for Boring holes to 10" diameter.



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These Boring Head Sets are made in six sizes.

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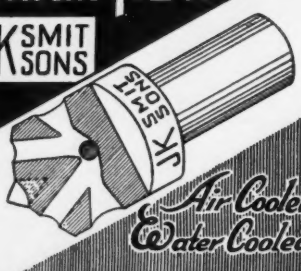

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INDUSTRIAL DIAMOND IMPORTERS

fering with the eyelashes. In the eve of fracture by an irresistible blow, tes have indicated that the curvature tend to push the fragments out and aw from the eye. These 6-Curve Lens are optional equipment in Americ Optical goggles.

Thor No. U-38 Portable Electric Polisher

The Independent Pneumatic Tool Co 610 W. Jackson Blvd., Chicago, Ill brought out the U-38 Portable Electric Polisher shown in the illustration.

Features of this Thor Polisher are h light weight, its perfect balance an ease of handling. It is equipped wit

Thor No. U-38 Portable Electric Polisher

a powerful Thor Standard Motor. Bot the armature and the spindle run i ball bearings which give maximum torque to the wheel. Gears are cut o alloy steel and heat treated. The ma chine is designed so that it can easil be taken apart for inspection and clean ing. Motor can be inspected while run ning by merely removing the two brus covers. A side handle can be used o either side of the machine to accommo date the operator. Equipment includes one 7-in. flexible rubber pad; one 7-in felt pad and one 8-in. sheep wool pad

"Markal" Paint in Stick Form

Heimer & Staley, 2312 S. Parkway Chicago, Ill., are now marketing a pain in stick form under the trade name o "Markal." Markal is said to be easil applied to any wet or dry surface and will not run when applied to hot metals Markal is said to be actual paint—not chalk or crayon—which can be carrie around in the pocket as easily as a pencil.

Markal is made in two types; one for cold marking and the other for hot marking. The cold marking type is used for marking metals. The manufacturer states that the stick paint dries and re mains as permanent as any other paint but without the necessary messiness which accompanies paint and brush

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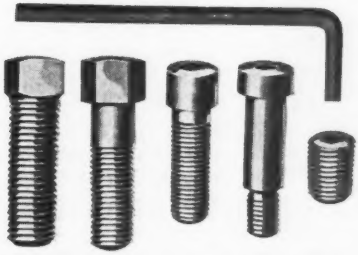

Representative members of the Mac-it family reading from left to right: Square Head Set, Hex Head Cap, Socket Head Cap, Socket Head Stripper Bolt, Hollow Set; and (at the top) Mac-it Wrench.

THE STRONG-CARLISLE and HAMMOND CO.

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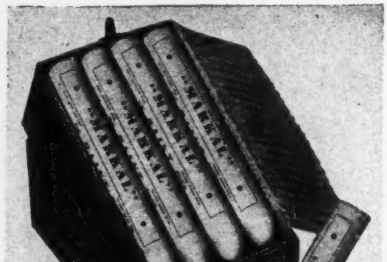

"Markal" Paint in Stick Form

marking. Markal for hot marking is used on forgings, castings, and other hot metal shapes at any temperature from 300 to 1200 deg. F. It is said that it will not run or flow while hot, or peel off after cooling. The figures and symbols are said to remain clearly legible indefinitely. Markal is weatherproof. Markal hot markings have remained clear-cut at the end of six months as the day they were made.

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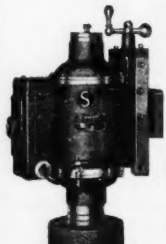

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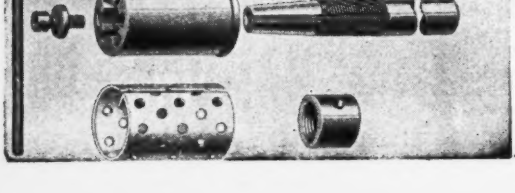

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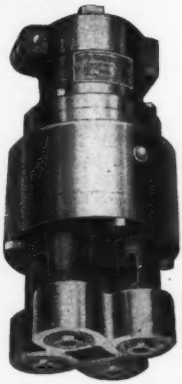

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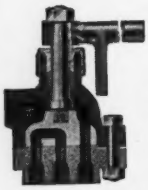

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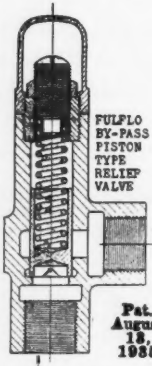

Fulflo Specialties Co., Inc.
BLANCHESTER OHIO

LOXAL METAL COATING. The u and advantages of Loxal Metal Coati are fully outlined in a four-page fol which is being issued by Hanson-W Winkle-Munning Company, Matawan, J. The folder states that Loxal can b be applied by using an iron tank, equ ped with heating coils, in which Lo Powder is dissolved in hot water. Me parts that are to be coated are dip into the solution which leaves a th coating that forms a bond with the m face of the metal, preventing rust. C free upon request.

RYERSON - ALLEGHENY STAINLE STEEL BOOKLET. This booklet, print in seven colors and devoted to t beauty, popularity, and endurance stainless steel, is now being distribut by Joseph T. Ryerson & Son, Inc., Lo Box U, Chicago, Ill. The booklet is pr fusely illustrated with pictures of a w variety of stainless steel articles and pr sents graphically the applications of legheny Stainless Steel in all lines industry. The increasing popularity stainless steel for all types of produ is evident; also its use in equipment a production machinery where long and improved processes are importa factors. A copy of the booklet will sent free upon application.

1936 EDITION, GENERAL CATALO OF JOHNSON MAINTENANCE BRONZ This catalog, now being issued by Joh son Bronze Co., New Castle, Pa., co tains 40 pages divided into three s tions. Section 1 includes complete siz and weight information on Johnson Di versal Completely Machined Bron Bars, both cored and solid. Section lists more than 600 sizes of general pu pose bearings, together with prices a quantity discounts. Section 3 deals e tirely with Johnson Electric Motor Ser ice Bearings. Each individual bearing illustrated. All of these various produc are presented by means of illustration Copies free to users of bronze.

NIAGARA INCLINABLE PRESS BU LETIN 58-E. This 34-page 8½x11 catalog contains photographs, drawin descriptions, and specifications of th line of inclinable presses made Niagara Machine & Tool Works, Northland Ave., Buffalo, N. Y. The bo is profusely illustrated and the te contains all information that a buy may need to help him in selecting th proper press for his requirements. Co free upon request.

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Used for stamping Name Plates, Tags, Small Parts, and Small Tools.

For Numbering or Lettering place the part beneath the wheels and hit with a hammer.

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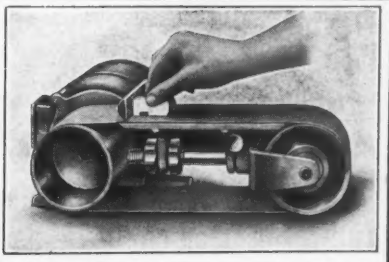

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● Here's the No. 601 Abrasive Belt Surfacer and Polisher. It's a real profit-earner for cleaning and finishing castings, removing burrs, straightening and finishing dies, stampings and any work that can be ground. It does away with much hand labor. Low in cost. Direct motor connected.

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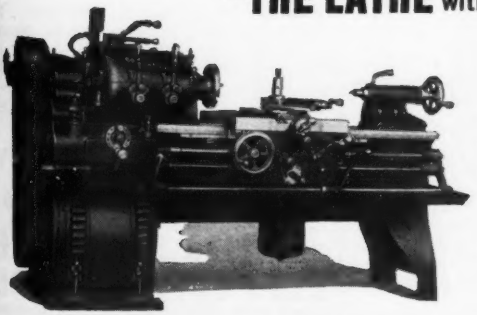

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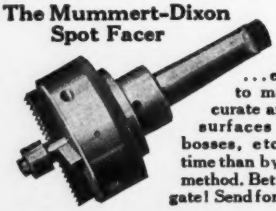

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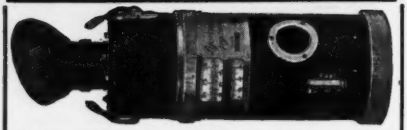

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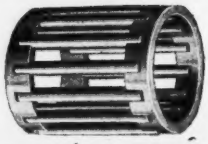

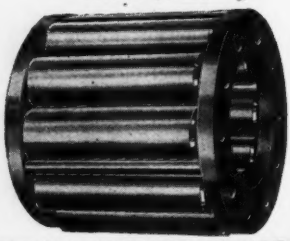

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A copy of this book is available u request.

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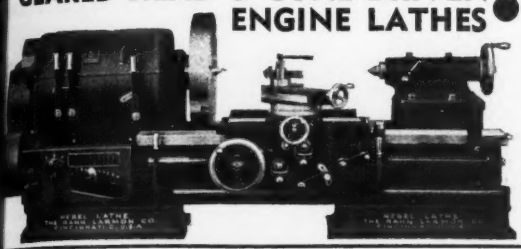

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20 years without a drink—

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Whitney Company, Hartford, Conn. The folder includes complete tables of sizes and prices. Copy free upon request.

"MACHINE TOOL APPLICATIONS OF NORMA-HOFFMANN PRECISION BEARINGS" is the title of an engineering bulletin that has been issued by Norma-Hoffmann Bearings Corporation, Stamford, Conn. It shows, in blue print drawings, a wide diversity of applications of precision ball, roller and thrust bearings in machine spindles, drills, milling machines, boring machines, grinder spindles, lathe headstocks and centers, and so on. The details of mounting and assembly are clearly shown in each c and the book should be helpful to e machine designer and engineer. O free upon request.

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